March, 1959

Price, $1.00

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

SCHOOL SHOP ANNUAL

They bridge the gap

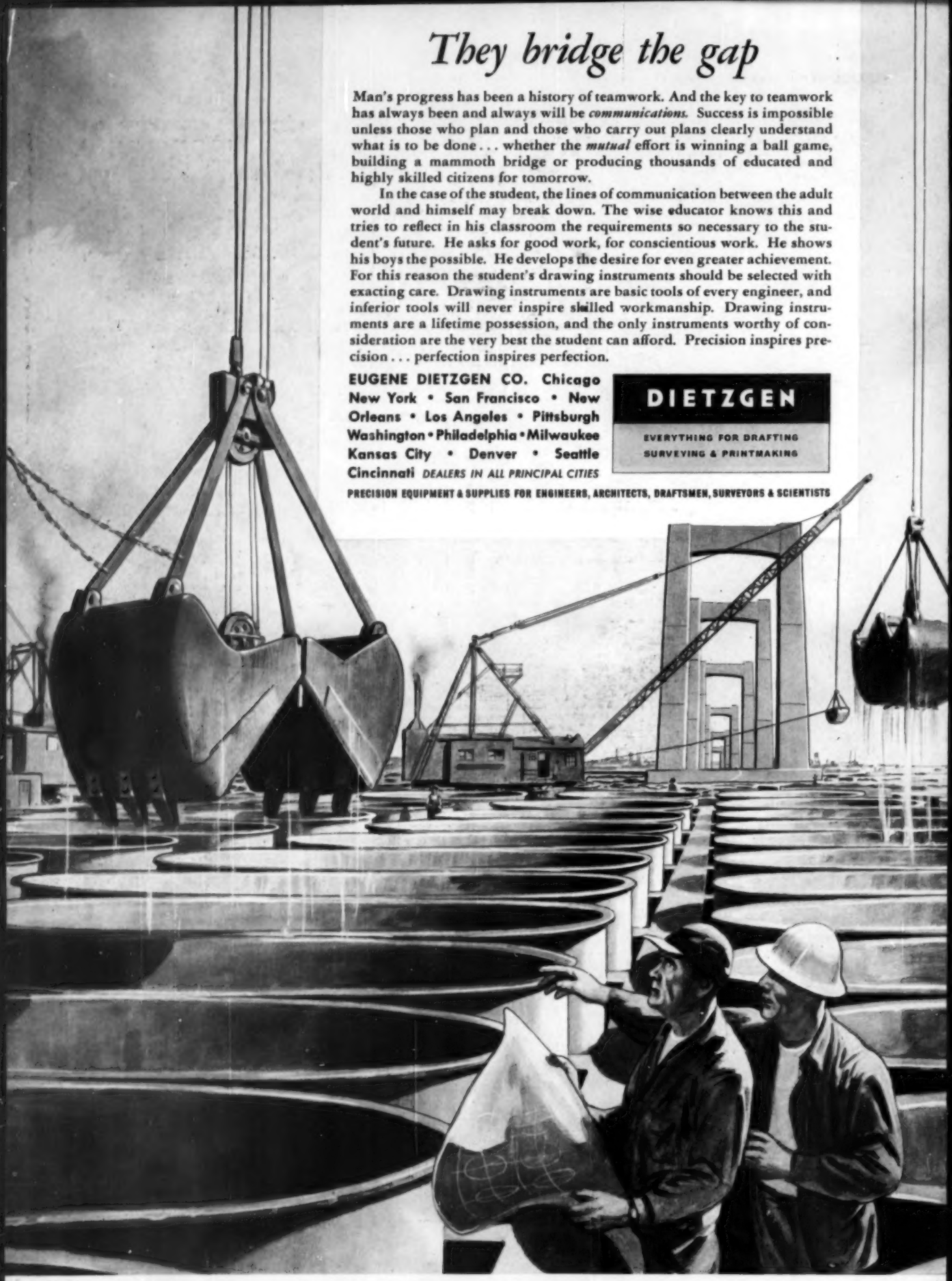
Man's progress has been a history of teamwork. And the key to teamwork has always been and always will be *communications.* Success is impossible unless those who plan and those who carry out plans clearly understand what is to be done . . . whether the *mutual* effort is winning a ball game, building a mammoth bridge or producing thousands of educated and highly skilled citizens for tomorrow.

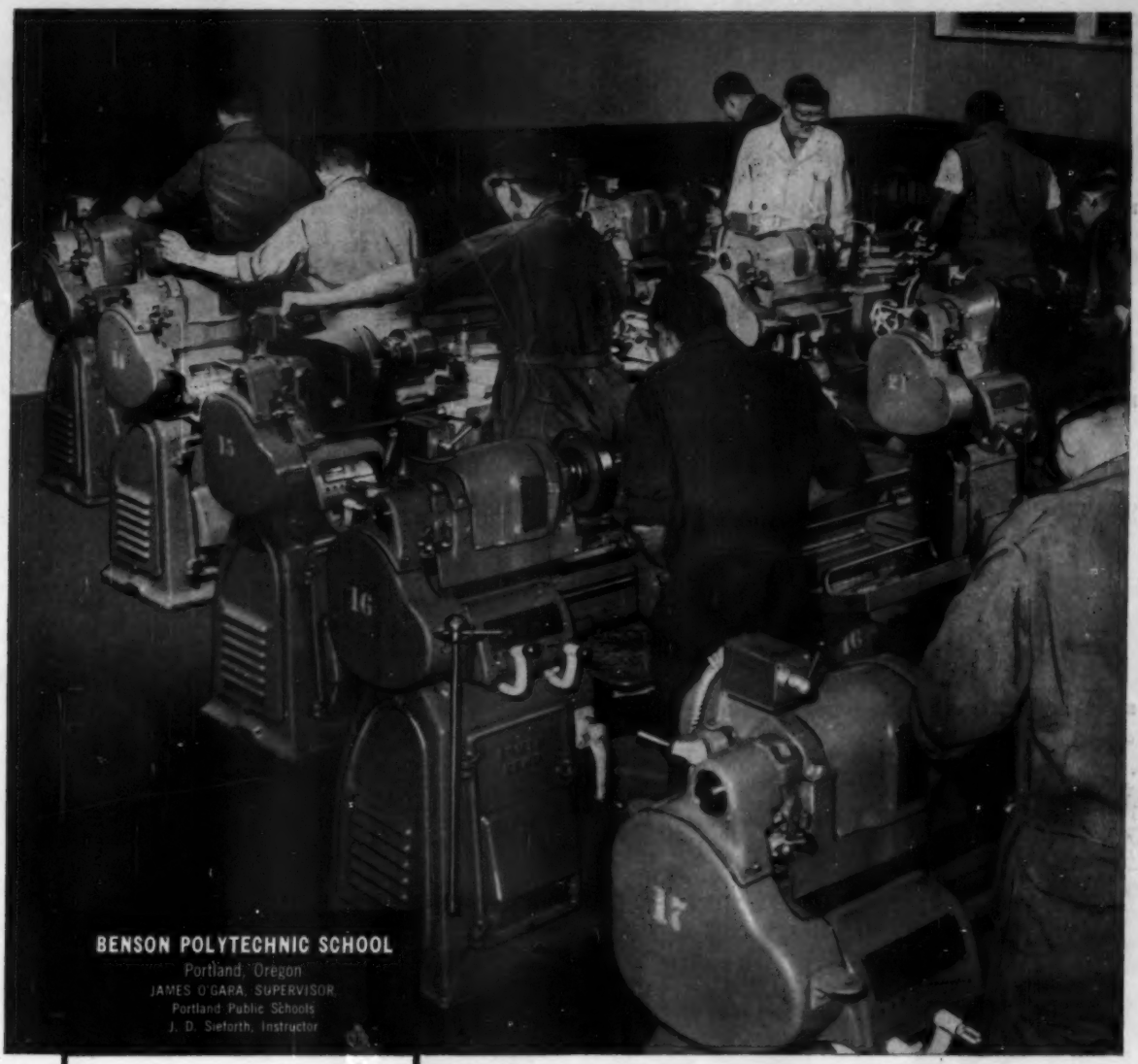
In the case of the student, the lines of communication between the adult world and himself may break down. The wise educator knows this and tries to reflect in his classroom the requirements so necessary to the student's future. He asks for good work, for conscientious work. He shows his boys the possible. He develops the desire for even greater achievement. For this reason the student's drawing instruments should be selected with exacting care. Drawing instruments are basic tools of every engineer, and inferior tools will never inspire skilled workmanship. Drawing instruments are a lifetime possession, and the only instruments worthy of consideration are the very best the student can afford. Precision inspires precision . . . perfection inspires perfection.

EUGENE DIETZGEN CO. Chicago
New York • San Francisco • New Orleans • Los Angeles • Pittsburgh
Washington • Philadelphia • Milwaukee
Kansas City • Denver • Seattle
Cincinnati *DEALERS IN ALL PRINCIPAL CITIES*

DIETZGEN
EVERYTHING FOR DRAFTING
SURVEYING & PRINTMAKING

PRECISION EQUIPMENT & SUPPLIES FOR ENGINEERS, ARCHITECTS, DRAFTSMEN, SURVEYORS & SCIENTISTS





BENSON POLYTECHNIC SCHOOL
Portland, Oregon
JAMES O'GARA, SUPERVISOR
Portland Public Schools
J. D. Sieforth, Instructor

Portland picks SOUTH BEND

Years of hard usage is the best test of the dependability of shop equipment. That's why countless schools have insisted that only South Bends replace their old South Bends. These rugged lathes go on year after year with surprisingly little maintenance. Since they are built for industrial production work they often withstand the abuse of a generation or more of students.

It is important that dependability be considered the next time you make a decision on lathes—it has an important bearing upon available machine hours and maintenance costs. It is just one more thing in which South Bend Lathes are not surpassed.

We would like you to have the complete story—just mail the coupon. *South Bend 13" Lathes, illustrated in use at Benson Polytechnic School, are priced as low as $1675 f.o.b. factory.*

SOUTH BEND LATHE
South Bend 22, Indiana
Building Better Tools Since 1906

SOUTH BEND LATHE, South Bend 22, Indiana
Please send information on Lathes, Milling Machines, Shapers, Drill Presses and Pedestal Grinders.

NAME_____ SCHOOL_____

STREET_____

CITY & ZONE_____ STATE_____

(For more information from advertisers, use the postcard on page 91A)

NOW!

A Complete Woodworking Shop

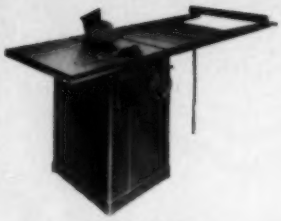
Choose from Yates-American J-Line

Built by woodworking-machinery specialists for safety, accuracy and economy.

18" x 6" Surfacer

New! 14" Lathe
38" Between Centers

6"-8" Jointers
With Exclusive
Shear-Cutting Fence

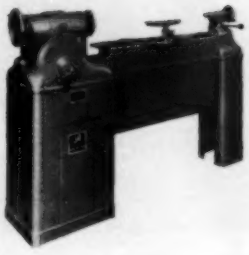


10" Tilting Arbor
Circular Saw
Bigger-than-ever Capacity

New! Jig Saw
Big 26" Capacity

20" Band Saw

New! 14" Band Saw



12" Lathe
Choice of gap or
solid bed at no extra cost

Shaper

New! Combination
6" Belt and Disc Sander

Yates-American
BELOIT, WISCONSIN

Branch Offices:
Chicago, Ill., Atlanta, Ga., Portland, Ore.

Since 1883, leading builders of machines for the woodworking industries

■■■■■■ *Tear out coupon and mail today!* ■■■■■■■

YATES-AMERICAN
721 N. Fourth Street, Beloit, Wisconsin

Send me Bulletin MO-661 and name of my
Yates-American J-line distributor

Name.....
Position.....
School.....
Address.....
City..... Zone..... State.....

(For more information from advertisers, use the postcard on page 91A)

MARCH
1959

VOL. 48 NO. 3

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

Published on the 15th of the month preceding the date of issue by THE BRUCE PUBLISHING CO., 400 North Broadway, Milwaukee 1, Wis. • CENTRAL OFFICE: 20 North Wacker Drive, Chicago 6, Ill. • EASTERN OFFICE: 232 Broadway, New York 7, N. Y.

This Month's Cover

This picture shows a student who is grinding a conical point on a machine center. As shown, the young man is dressed to do the job safely. *Safety First* always pays!

Photograph by Lois Stone, who was a graphic arts student at the Tucson High School, Tucson, Ariz., when the picture was made.

Submitted by Harry A. Goldstein, A.P.S.A., who teaches the course.

★ ★ ★

BUY U. S. SAVINGS BONDS

★ ★ ★

Entered January 5, 1914, at Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright 1959 by the Bruce Publishing Co. Title registered as Trade Mark U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information.—Subscription price in the United States, U.S. possessions, and Canada, $3.75 a year, payable in advance. In all foreign countries, $4.25. Single copies, 50 cents; March School Shop Annual, $1.00.

Discontinuances.—Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old, as well as the new address. Complaints of non-receipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions.—The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for upon publication. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed.—The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

CONTENTS

Shop Plans

Planning School Shops for Tomorrow.....*Chris H. Groneman* 59
Cleveland's New Max S. Hayes Trade School.....*D. C. Courtright* 64
Industrial Arts Department — Mt. Pleasant Senior High School .....*Herbert L. Nelson* and *Lornie G. Kerr* 74
New Junior High Indusrtial Arts Shops..*Lyle Soeteber* and *Wm. Wood* 75
Helpful Aids for the Industrial Arts Teacher.....*Ernst H. Suerken* 77
New Hobart Brothers Technical School.....*W. H. Hobart, Jr.* 78
Lake Orion Community Schools.....*Walter G. Hampton* 81
Waltham's Vocational High School.....*James R. Westall* 83
Additions and Alterations to the Vocational School, South Milwaukee, Wis.....*Joseph Longo* 88
William H. Danforth Industrial Arts Building.....*Rude Osolnik* 92

Course Outlines

Industrial Arts Offers Many Courses.....*Wallace Miliard* 86
A Proved Method of Teaching Blueprint Reading...*Arnot P. McIntee* 103
A Basic Vocabulary and Glossary in Machine Tools and Job Machine Shops.....*Ernst H. Suerken* 104
The Guided Professional Tour.....*Hilton L. Thompson* 108

Tool Panels

The Open Tool Panel.....*John T. DeNunzio* 99
General Tool Panel for the Drafting Room.....*Thomas J. Minter* 101

Miscellaneous

Shop Organization Simplified.....*Louis Cenci* 97
Continuous Observational Testing.....*Roland Bacon* 101
A Useful Technique of Teaching Tool Terminology and Identification .....*L. V. Patterson* 103

Equipment and Supply List

Woodworking 30A
Automotive 36A
Electrical 40A
Metalworking 46A
Drafting 58A
Print Shop 66A
Ceramics 74A
Office Machines 74A
Refrigeration 75A
Association News 6A
Personal News 10A
News Notes 14A
New Publications 54A
Descriptive Material 67A
Shop Equipment News 78A

(For more information from advertisers, use the postcard on page 91A)

What a wonderful way to equip Art and Mechanical Drawing classes–

NEW HALLOWELL "SPACE-CONTROL" UNITS

The Hallowell "Personalized" Table

While the student is working at this table it is his "own". Contains only his *own* drawer and drawing board. There are no other drawers or drawing board storage cabinets to take up floor space or reduce leg room. Table is easy to move, if necessary, and easy to clean around.

The Hallowell "Safe Deposit" Drawer

The Hallowell "Safe Deposit" Drawer slips into the table where it remains during class, is transferred to the Storage Unit by student when class is dismissed. Each drawer has its own lock, may be locked into drawing table or storage unit.

Hallowell Storage Units

Storage Units may be arranged in many ways to suit the needs of your classes. Each drawer unit holds 4 drawers; each drawing board unit accommodates 12 drawing boards in separate slots. There's no need for the student to remove his unfinished drawing from the board between classes.

Shown on the opposite page are:

Model 1056 Drawing Table—Laminated close-grained hardwood top 42" x 30" x 1¼" with flush-mounted U-channel at each end. Height of work surface: 37" at front, 41¼" at back. Legs and braces are heavy extruded aluminum tubing with anodized satin finish. Legs have adjustable glides.

Model 6402 Drawer Pedestal Unit—16" wide x 29½" high with base x 21½" deep. Capacity: 4 drawers, each with individual cylinder locks. All welded steel construction.

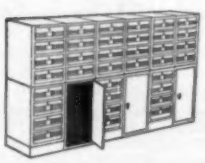
Model 1058 Drawing Board Cabinet—16" wide x 29½" high x 21½" deep. Capacity: 12 drawing boards. Construction: All-welded steel with box flanges. Built-in separators for drawing boards.

Model 241 Tubular Stool (without back-rest)—Adjustable round wood seat, tubular steel footrest.

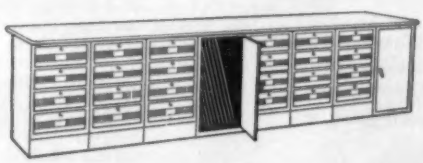
Model 245 Tubular Stool—Hinged plywood back; round adjustable wood seat, tubular steel footrest.

There's a complete line of school shop furniture, too. Write for Catalog 2112, Columbia-Hallowell Division, SPS, Jenkintown 74, Pa., or SPS Western, Santa Ana, Calif.

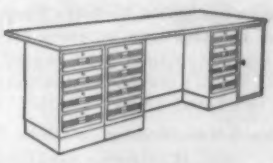
YOU CAN ARRANGE HALLOWELL UNITS IN A WIDE VARIETY OF WAYS



1. Stacked–space for 36 drawers, 36 boards



2. Side by side–holding 24 drawers, 24 boards



3. Arranged as a planning table (12 drawers, 12 boards)

SPS **Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • Jenkintown, Pa. • SPS Western • The Cleveland Cap Screw Company • Columbia Steel Equipment Co. • National Machine Products Co. • Nutt-Shel Co. • Standco Canada, Ltd. • Unbrako Socket Screw Co., Limited

(For more information from advertisers, use the postcard on page 91A)

Let us send you this

NEW DELTA CATALOG

. . . It puts the world's most complete line of power tools for school shops at your finger tips—offers a single source for 53 machines, 246 models, over 1300 accessories. You can choose the right tool to teach every woodworking and metalworking operation—and students learn on the tools they'll use in industry.

DELTA TOOLS ARE SAFE
DELTA TOOLS ARE PRACTICAL
DELTA TOOLS ARE ECONOMICAL

That's why: 72% of U.S. schools teaching shop teach with Delta Power Tools.

Send For Your FREE Catalog Today—Complete descriptions and specifications on every Delta tool and accessory. See the complete line at your nearest Delta Dealer and ask him about Delta's unequalled teaching aids for shop instructors . . . he's listed under "TOOLS" in the Yellow Pages.

Rockwell Manufacturing Co., Delta Power Tool Division,
402C N. Lexington Ave., Pittsburgh 8, Pa.

DELTA POWER TOOLS
another fine product by
ROCKWELL

Association News

COMING CONVENTIONS

Feb. 27–28. Industrial Teachers Conference, at the A. & M. College of Texas, College Station, Tex. Secretary, Leslie V. Hawkins, Texas A. & M. College, College Station, Tex.

Mar. 13–14. California Industrial Education Association, at Stockton Memorial Auditorium, Stockton, Calif.

Mar. 19–20. Tennessee Vocational Association, at Nashville, Tenn. Secretary, W. A. Seeley, 111 E. Cordell Hull Bldg., Nashville 3, Tenn.

Mar. 19–21. Illinois Vocational Association, at Pere Marquette Hotel, Peoria, Ill. Secretary, Orlin D. Trapp, Waukegan Township High School, Waukegan, Ill.

Mar. 19–21. Ohio Industrial Arts Association, at Niel House, Columbus, Ohio. Secretary, Robert Boyer, 7463 Midland Rd., Cleveland 31, Ohio.

Mar. 27–28. Washington Industrial Arts Association, at Shadle Park High School, Spokane, Wash. Secretary, Carl Schmidt, N. 120 Locust St., Spokane, Wash.

Apr. 2–4. Indiana Industrial Education Association, at Hotel Antlers, Indianapolis, Ind. Secretary, John H. Hinds, High School, Elwood, Ind.

Apr. 9–11. Michigan Industrial Arts Association, at Pantlind Hotel, Grand Rapids, Mich. Secretary, John Koenig, 4628 Flajole Road, Midland, Mich.

Apr. 13–16. Department of Audio-Visual Instruction (NEA), at Olympic Hotel, Seattle, Wash. Secretary, Mrs. Mickey Bloodworth, Department of A-V Instruction — NEA, 1201 Sixteenth St., N.W., Washington 6, D. C.

Apr. 17–18. West Virginia Vocational Association, at 4-H Camp, Jackson's Mill, W. Va. Secretary, Fred W. Eberle, 1211 Grishaber St., South Charleston 3, W. Va.

Apr. 18–19. Missouri Industrial Education Association, at University of Missouri Education Building, Columbia, Mo. Secretary, Maurice L. Stewart, State Department of Education, Jefferson City, Mo.

Apr. 22–25. American Industrial Arts Association, at Lafayette Hotel, Long Beach, Calif. Secretary, Dr. Kenneth W. Brown, P.O. Box 2626, Buffalo 26, N. Y.

ANNUAL SPRING CONFERENCE

The 21st annual Industrial Arts Spring Conference of industrial arts teachers will take place on May 7 and 8, 1959, at State University Teachers College, Oswego, N. Y.

Featured will be outstanding educators, informal seminars in each of the industrial arts laboratories, and displays and demonstrations by a large group of commercial exhibitors.

Dr. Walter Crewson, associate commissioner for elementary, secondary, and adult education, New York State Department of Education, will be the keynote speaker at the opening session of the conference.

Dr. Kermit Seefeld, chairman of the industrial arts department at Santa Barbara College, University of California, and president of the American Industrial Arts Association, will deliver the principal address at the Thursday evening banquet. The banquet will be held at the newly completed Lakeside Dining Hall, overlooking Lake Ontario.

Friday morning's session will be devoted to informal seminars in each of Oswego's industrial arts laboratories where conferees will have the opportunity to meet with Oswego instructors to discuss mutual problems connected with their areas of specialization.

THE OHIO INDUSTRIAL ARTS ASSOCIATION

The annual convention of the Ohio Industrial Arts Association will be held at the Niel House, Columbus, Ohio, March 19, 20, and 21, 1959. The convention theme is "Professionalism of the Industrial Arts Teacher."

The program begins with registration at one o'clock on Thursday, March 19, and the chairman of the afternoon session is Menzo Stark, chairman of the department of industrial education at Wilmington College, Wilmington, Ohio.

Dr. Marshall L. Schmitt, specialist for industrial arts, U. S. Office of Education, Washington, D. C., will be the speaker and his topic is "Problems of Industrial Arts Teacher Education."

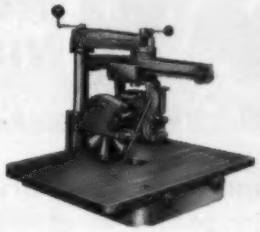
Panel members include: (Teacher Education) — Andrew W. Paton; (Industrial Arts Supervisor) — J. Herbert Detrick; (Industrial Arts Teacher) — Tom Eachus.

The chairman for the Thursday evening meeting is Merrle E. Leggett, director of industrial arts, Medina, Ohio. Several speakers will cover the subject "Responsibilities of the Industrial Arts Teacher." Repre-

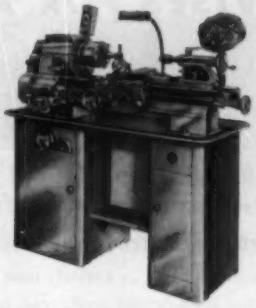
(Continued on page 10A)

(For more information from advertisers, use the postcard on page 91A)

7" GRINDER
Also 6" Tool Grinder

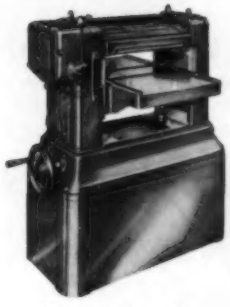


9" RADIAL SAW
Also 10" Portable, 12"-14", 16"-20"



11" METAL LATHE
4' and 5' Bed

15" DRILL PRESS—Also 14"
14" Super-Hi Sensitive, 17" and 20"



13" x 5" PLANER

6" BELT SANDER
Also 12" Disc Sander

24" SCROLL SAW

10" UNISAW ®
Also 9", 10" Bench, and 12" Tilting Arbor Saws

HEAVY DUTY
WOOD SHAPER

14" METAL-WOOD
BAND SAW
Also 14" and 20" Wood

6" JOINTER
Also 4" and 8" Long Bed

12" VARIABLE SPEED
WOOD LATHE
Also 12" Standard

DELTA POWER TOOLS

Teach with the tools industry uses

No matter what your requirements—in teaching woodworking or metalworking operations—there's a Delta tool to fit the job. Delta is the world's most complete line of power tools for school shops—53 machines, 246 models, over 1300 accessories. And Delta service, provided through your cooperative local Delta Dealer, is unmatched by any supplier to the school shop field. Shop instructors specify Delta Tools because they're safe, practical and economical. That's why: **72% of U. S. Schools Teaching Shop Teach With Delta Tools.** See the complete line of tools and accessories at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

FREE—Delta Industrial Catalog

Get all the facts on the complete line of Delta woodworking and metalworking tools and accessories. Write: Rockwell Mfg. Co., Delta Power Tool Div., 402C N. Lexington Ave., Pittsburgh 8, Pa.

DELTA POWER TOOLS
another fine product by
ROCKWELL

(For more information from advertisers, use the postcard on page 91A)

MODERN VISES FOR ALL OF TODAY'S NEEDS!

COLUMBIAN WOODWORKERS' VISES

new 3-point mounting reduces installation time 50%
assures better operation and longer life
streamlined . . . no sharp corners . . . tamper-proof . . . stronger and heavier

Greatly improved in appearance . . . entirely new in jaw, guide rod and mounting design, today's Columbian Woodworkers' Vises utilize the time-tested continuous screw mechanisms that have gained the preference of users everywhere.

Outstanding new feature is the exclusive 3-point mounting. Employing 2 slotted brackets and a center rest, this assures firm, tight vise mounting, ease of operation and longer life. Installation is reduced to a fraction of the time required by ordinary vises as the bench can be pre-drilled and bolts partially installed before vise is located. Mounting instructions and an accurate template are furnished with each vise.

When mounted, top of vise jaws is approximately 1/8" below bench top. Consequently, top edge of the bench will help to keep tools from striking metal jaws of vise. Bench top can be refinished without removing and remounting vises.

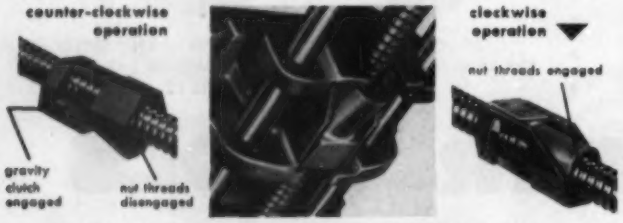
AA-8817

Drilled for Wood Facings
Choice of Dog Type or Plain Front Jaw
Hardwood Handle
tubular steel handle optional no extra cost
adjustable steel handle on 2 models
Slotted Mounting Brackets
Drag Bar
Streamlined No Sharp Corners
Guide Rods Hydraulically Pressed into One-Piece Jaw Assembly
Center Rest Holds Tight Against Bench
Cold Rolled Steel

Choice of 2 Continuous Screw Mechanisms

RAPID ACTING CONTINUOUS SCREW VISES

. . . for use where changes in jaw openings must be made frequently and fast!

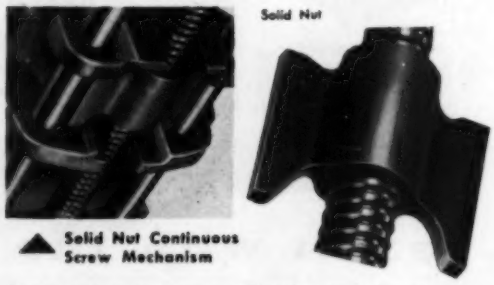


Rapid Acting "Power-Slide" Continuous Screw Mechanism

Key to superior operation is exclusive "Power-Slide" mechanism. This incorporates a gravity friction clutch which assures positive operation (no springs) and automatically compensates for wear. Counter-clockwise operation of screw disengages mechanism, facilitating "free sliding" adjustment of jaw opening. Clockwise operation of screw engages full 180° half-nut, producing continuous inward jaw movement and high pressure holding without slippage.

SOLID NUT CONTINUOUS SCREW VISES

. . . for general woodworking in industrial and school shops!



▲ **Solid Nut Continuous Screw Mechanism**

Heavy steel screw is made with double lead, fast running thread to provide maximum speed of operation. Solid Nut assures long, repair-free life.

2 models of Solid Nut Continuous Screw Vises are made with special Adjustable Steel Handles for extra fast operation.

Columbian Vises and Columbian Levels are sold by leading distributors everywhere.

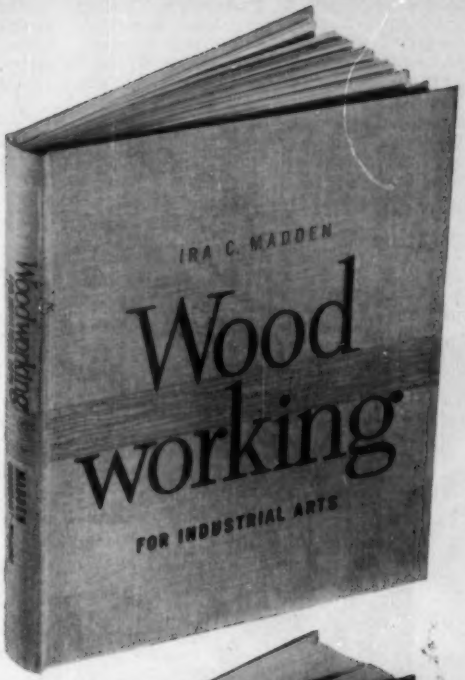
COLUMBIAN Vises
The Columbian Vise & Mfg. Co.
CLEVELAND 4, OHIO

(For more information from advertisers, use the postcard on page 91A)

GOODHEART WILLCOX PRACTICAL BOOKS

LOTS OF "SHOW-HOW" *for* SCHOOL-SHOPS · EASY TO USE !

Check Books You Would Like to Examine, and MAIL TODAY!



☐ **WOODWORKING FOR INDUSTRIAL ARTS.** By Ira C. Madden. Supplies basic knowledge about tools, woods, and finishing materials, used in productive shop work. Provides a wide selection of project materials of proven student interest in the form of detailed drawings and photos; also design suggestions and variations. Guides and helps students create in their own way. An outstanding text to be used by students of all ages, and teachers, to improve instruction in this important field. Replaces Creative Handicraft in Goodheart-Willcox line. $4.00.

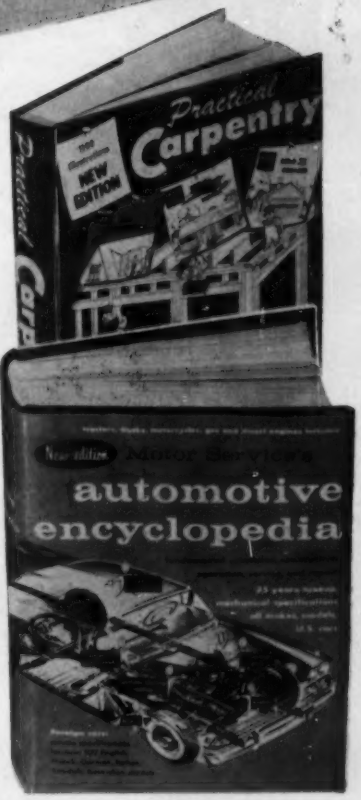
☐ **MOTOR SERVICE'S AUTOMOTIVE ENCYCLOPEDIA.** By Toboldt & Purvis. Greatest book available for teaching students Fundamental Principles and Basic Service Procedures — the foundation on which a sound, thorough knowledge of auto mechanics is based. Used by over 700 schools. $7.95.

☐ **AUTOMOTIVE ENCYCLOPEDIA STUDY GUIDE.** Teaching aid for Schools using Motor Service's Encyclopedia. Study Guide Sheets per set $2.00.

☐ **PRACTICAL CARPENTRY.** By Mix & Cirou. Used by more than 1050 schools! Places special emphasis on proper techniques so beginner will understand and become acquainted with best carpentry practices, and use of modern materials. New insert in four colors shows how to identify 32 different woods. Over 1100 illustrations. $5.00.

☐ **MODERN REFRIGERATION & AIR CONDITIONING.** By Althouse & Turnquist. Gives students sound foundation in Air Conditioning and Refrigeration Principles, and acquaints them with refrigerating mechanisms and their components. Covers application of refrigeration in all its branches — Domestic, Commercial; Residential, Car Air Conditioning, Heat Pumps, etc. $7.45.

☐ **MODERN WELDING PRACTICE.** By Althouse & Turnquist. Latest information on welding, metal cutting, heat treating, in non-technical form. Unbiased coverage of entire welding field in one book. Especially recommended as text for beginners. $5.00.



☐ Goodheart-Willcox's new **PAINTING & DECORATING ENCYCLOPEDIA.** By Wm. Don Jarvis. Complete library of up-to-date "know-how" on modern painting, decorating and wood finishing, in one easy-to-use volume. Prepared especially for use by apprentices, vocational students. $5.45.

☐ **COPE'S PLASTICS BOOK.** By D. W. Cope. Photos and step-by-step constructional details on more than 90 useful and colorful projects. Best ways to saw, machine, polish, form, cement, clean plastics. Special section on internal carving. $4.50.

☐ **ALL ABOUT SMALL GAS ENGINES.** By Jud Purvis. New field which offers lots of possibilities. Non-technical information on small two, four-cycle engines. $4.50.

☐ **AUTOMATIC TRANSMISSIONS SIMPLIFIED.** By Jud Purvis. Carefully explains transmission fundamentals, tells and shows how transmissions work; how to service and repair them. $5.45.

☐ **FIX YOUR FORD** $2.95
☐ **FIX YOUR CHEVROLET** 2.95
☐ **FIX YOUR PLYMOUTH** 2.95
☐ **103 EASY JIG SAW PROJECTS** 1.50
☐ **72 BIRD HOUSES & FEEDERS** You Can Make 1.50
☐ **PROJECTS FOR METALS,** by John R. Walker. 43 new projects 1.75
☐ **VOCATIONAL MATHEMATICS** (Shop Arithmetic) 1.50
☐ **VOCATIONAL MATHEMATICS** (Shop Geometry, Algebra, Trigonometry) 1.75
☐ **PLUMBING & PIPEFITTING LAYOUT JOB SHEETS** 2.95

GOODHEART-WILLCOX CO.
1322 S. Wabash, Dept. 55, Chicago 5

Please send me on 30 days approval books checked above. (20% Discount to Schools and Teachers.)

Name .....

Street .....

City ..... Zone ..... State .....

Publishers of Topnotch Texts Since 1921

(For more information from advertisers, use the postcard on page 91A)

ASSOCIATION NEWS

(Continued from page 6A)

senting the college division is Dr. William D. Stoner, chairman, industrial arts department, Miami University, Oxford, Ohio.

The Friday morning session is under the chairmanship of E. W. Tischendorf, chairman, industrial arts department, Kent State University, Kent, Ohio. The topic to be discussed will be "Industrial Arts and Scientific Trends."

The speaker of the day will be: (to be announced).

Panel members include: (Industrial Arts Teacher) — James Bogan; (Industrial Technology Program) — Dr. Donald Perry; (Science Teacher) — (to be announced).

On Friday afternoon the topic to be discussed is "Your Goals as a Professional Teacher."

F. Theodore Paige, industrial arts department, Ohio University, Athens, Ohio, is chairman of this session.

Dr. H. H. London, chairman, industrial arts department, University of Missouri, Columbia, Mo., will be the speaker.

Panel members include: (State Board of Education Member) — Paul L. Walker; (Industrial Arts Supervisor) — D. Arthur Bricker; (Industrial Arts Teacher Educator) — Dr. Robert W. Haws; (Industrial Arts Teacher) — Robert P. Wright.

The annual business meeting will be held at 3:30 p.m., at the Junior Ballroom, with Richard O. Knight, president, O.I.A.A., as chairman.

The annual banquet will follow at 6:30 p.m., with Mr. Knight acting as chairman, and a guest speaker will give the address of the evening.

Saturday morning's session will be under the chairmanship of Phil Waldeck, state supervisor of industrial arts, Columbus, Ohio. The subject to be discussed is "How Your Professional Associations are Promoting Industrial Arts."

Among speakers listed are Oran T. Casey and Joy Mohrhardt.

On Saturady at 11:00 a.m., the Ship's program will be conducted in the Junior Ballroom.

Robert Deafenbaugh, industrial arts teacher, Newark, Ohio, and commercial exhibits manager, will be the chairman.

William B. Jennison, School Arts Magazine, Worcester, Mass., is the Ship's Captain, and Dale T. Musselman, Brodhead-Garrett Co., Cleveland, Ohio, is deck officer. — *Edgar Hare, chairman of publicity.*

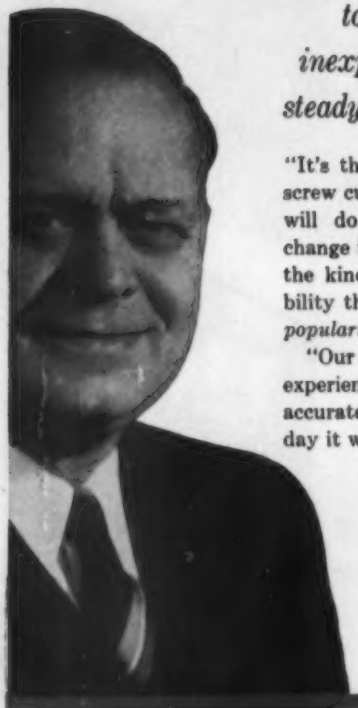
WEST VIRGINIA VOCATIONAL ASSOCIATION

The annual meeting of the West Virginia Vocational Association will be held on April 17 and 18, 1959, at Jackson's Mill, W. Va.

Dr. M. D. Mobley, executive secretary, American Vocational Association, will be one of the principal speakers on the program.

William F. Cline, principal, Kanawha Technical High School, Charleston, W. Va., is program chairman. — *Fred W. Eberle, secretary.*

"This lathe is a work horse... Teaching the intricate skills of lathe metalworking to a shop full of impetuous, inexperienced youngsters takes steady nerves and sturdy lathes.



"It's the kind of job this Logan 11" screw cutting lathe is built for. . . . It will do *more* things *well*, with no change in bearing adjustment. This is the kind of versatility and dependability that spells *low upkeep* and *high popularity* with educators!

"Our shop instructors know from experience that this Logan will be as accurate, after years of use, as the day it was set up."

Look at a Logan before you leap

Logan 11" swing lathe with 1" collet capacity, 1⅜" spindle bore, 24" and 36" centers, and 16-speed V-belt drive. . . . The Logan line includes turret and screw cutting lathes from 9" swing and 17" between centers to 14" swing and 40" between centers. Also 8" shapers.

CATALOG ON REQUEST. *Phone your* LOGAN *dealer or drop a line to:*

LOGAN ENGINEERING CO.

DEPT. D-359 4901 Lawrence Avenue, Chicago 30, Illinois

Personal News

DR. WORTHINGTON IN NEW POSITION

Dr. Robert M. Worthington has recently been appointed professor and chairman of the industrial-arts department at Trenton State College, Trenton, N. J. He succeeds Professor Fred. O. Armstrong who retired in June, 1958, after heading the department at Trenton State for 27 years.

Dr. Robert M. Worthington

Prior to his appointment at Trenton, Dr. Worthington served as industrial education consultant with the Minnesota State Department of Education. He has held teaching positions at the University of Minnesota, Purdue University, and in the St. Paul, Minn., public schools. He directed industrial arts summer workshops for Bemidji State College, Bemidji, Minn.

He received his doctor of philosophy degree from the University of Minnesota in June. 1958. His thesis was an experimental study of

(Continued on page 14A)

There is nothing finer than a . . .

DIAMOND®

The DIAMOND and DIAMALLOY trade-marks assure the user lifetime service satisfaction in wrenches, pliers and snips. The finest tools have these trade-marks . . .

DIAMOND DIAMALLOY

Manufacturers of hand tools for fifty years

DIAMOND TOOL *and Horseshoe Co.*

DULUTH, MINNESOTA • TORONTO, ONTARIO

Your shop needs a versatile AMF DeWALT®

for safer, easier student training

DeWALT is the machine your students are most likely to use after graduation ... it's smart to train them on a DeWALT now.

MODEL GA for Vocational Training

12- and 14-inch radial arm saws. 12" blade cuts 3½" deep, 14" blade cuts 4½" deep. Rips 28¾" wide, cross cuts 16" x 1" with standard arm. (Longer arm available.)

Uniform box-section non-retractable cantilever arm rotates 360° around the supporting column. Top-elevating crank. Quick-set miter locating latches at 0° and 45°. Eight (8) ball-bearing roller head rides directly on machined trackways inside arm. Direct-drive, totally-enclosed, fan-cooled motor (3425 r.p.m. full load), manual thermal switch. Calibrated miter, bevel, and rip scales, positive bevel-locating latches 0°, 45° and 90°. Steel table with legs, wood top. 14" diameter automatic safety guard with kickback device. (Select motor, saw blade and arm size from models shown below.) Power safety brake (optional).

Model	Std. Saw Blade	H.P.	Motor 3425 R.P.M.
GAK	12"	2	Single-phase, 60-cycle AC, 115/230 volts
GAN	14"	3	Three-phase, 60 cycle AC, 220/440 or 550 volts
GAO	14"	3	Three-phase, 60-cycle AC, 115/230 volts
GAR	14"	3	Three-phase, 60-cycle AC, 220/440 or 550 volts

MODEL GW for Industrial Arts

10-inch radial arm saw, cuts 3" deep, rips 26" wide, cross-cuts 16" x 1". Uniform box-section non-retractable cantilever arm rotates 360° around the supporting column. Top-elevating crank. Quick-set miter locating latches at 0° and 45°. Four (4) ball-bearing roller head rides directly on machined trackways inside arm. 1½ h.p. direct-drive, protected, fan-cooled motor (3425 r.p.m. full load), manual key switch. Calibrated miter, bevel, and rip scales, positive bevel-locating latches 0°, 45° and 90°. Steel table with legs, wood top. 10" diameter saw and "Auto-float" safety guard with kickback device. Power safety brake (optional).

Model	Saw	H.P.	Motor 3425 R.P.M.
GW-1	10"	1½	120/240 volts, 1-phase, 60 cycles AC
GW-M	10"	1½	220, 440 or 550 volts, 3-phase, 60 cycles AC (Specify One Voltage)

AC 2-phase or 50 cycles available on request for GA and GW.

(For more information from advertisers, use the postcard on page 91A)

Let your local De Walt Dealer show you why De Walt is the safest, most efficient, easiest-to-use woodworking tool of all... how it makes *teaching* easier.

You need De Walt SAFETY. *Only the AMF De Walt® Power Saw* offers you such a combination of safety features.

Top-side cutting action lets the operator see the blade *and* the layout mark for every cut. Blade action holds the material down and against the fence for added safety. *Pull-across cutting* lets the operator move *with* the saw for most cuts, not against it as with other tools. *All controls are above* the table and clearly marked for safe, sure set-ups every time. *Original Safety Key Switch* prevents unauthorized use. *Work is always level* and moves in a straight line – you fit the *saw* to the *work*, not vice versa as with other tools. No balancing lumber at awkward and dangerous angles. *Exclusive tool guard* adds still greater safety – completely encloses shaper knives and other tools, yet adjusts to any size lumber in seconds. *Special De Walt Power Brake* stops saw blade in a few seconds for maximum protection. *Spir'Ator Safety Return* automatically draws motor and blade to a safe position when released.

You need De Walt EFFICIENCY. One De Walt Power Saw actually does the work of *12 different power tools* – and does each one *as well or better* than a single purpose machine!

As a saw, De Walt makes every possible cut, quickly, safely, with unsurpassed accuracy. Instantly adjusts to any miter, bevel, or compound angle – sets up for either right- or left-hand ripping. Allows repeated cuts from one marking. *With a dado head*, De Walt's *precision depth control* and *top-side cutting* give on-the-line accuracy for all cuts. *Full-tilting arbor* simplifies rabbeting, grooving, radius and saucer cuts. *As a shaper*, De Walt provides maximum flexibility by tilting, raising, or lowering to *any* desired position – gives a *full 50% more shapes per cutter*. And you have another rotary tool every time you attach a different head to De Walt's powerful direct-drive motor. *Your one De Walt gives unsurpassed efficiency for every cutting job.*

You need De Walt PRACTICALITY. No other single piece of woodworking equipment makes as much "sense" as a De Walt in your shop, because no other offers such practical advantages.

With De Walt's great versatility, you can often save the cost of a number of other machines which frequently stand idle. Your De Walt will be the most-used machine in the shop. The De Walt can be placed and operated *against a wall – takes up 75% less space than old style table saws*. And with a De Walt, you can be sure you are training your students on the kind of equipment they will later use. For De Walt is the choice of woodworkers throughout industry – for carpentry, construction, pattern shops, cabinetry, maintenance and crating departments – tried and proved by *millions* of operators.

You may have seen the De Walt Power Saw demonstrated at the National or your State Convention. If not, *see your Dealer* for a demonstration. Send the coupon below for your FREE copy of "Job-Tested Cutting Methods". Valuable new shop teacher's aid now available – "Easy Ways to Expert Woodworking" – just $3.95.

Another AMF Product
DE WALT POWER TOOLS

De Walt Inc., Dept. IA-93, Lancaster, Pa.
Subsidiary of American Machine & Foundry Company
Please send FREE Booklet – *Job-Tested Cutting Methods*
☐ I enclose $3.95 check or money order for teacher's aid manual.

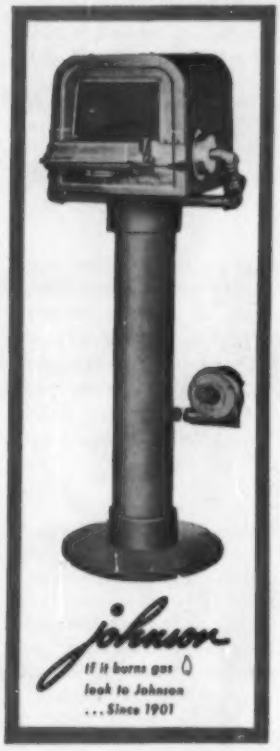
NAME_____
SCHOOL_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

(For more information from advertisers, use the postcard on page 91A)

HEAT TREATING TEACHING AID

johnson

No. 120 furnace heats to 1500° in 5 minutes . . . saves time in the shop



No long waiting for warm up when you instruct heat treating with a powerful Johnson No. 120 Hi-Speed Furnace. Heats 2300° in 30 minutes, temperature easily adjusted for carbon and high speed steels, tools, dies, and small metal parts. Economical operation with natural, mixed, artificial or bottled gas. Complete with Carbofrax hearth, G.E. Motor and Johnson Blower. Firebox 5" by 7¾" by 13½". 120,000 BTUs per hour maximum. $184.00 F.O.B. Factory.

Write for FREE JOHNSON CATALOG plus information on factory reconditioning your present Johnson Furnaces.

JOHNSON GAS APPLIANCE COMPANY

885 E Avenue N.W., Cedar Rapids, Iowa

PERSONAL NEWS NOTES

(Continued from page 10A)

psychological factors affecting learning from the demonstration. His master's degree was received at the University of Minnesota, and bachelor's degree at Eastern Kentucky State College.

Dr. Worthington is a cabinet member of the AVA Industrial Arts Policies and Planning Committee, and is chairman of the National Industrial Arts Scholarship Committee sponsored by the Industrial Arts Division of AVA. He is a past president of the Minnesota Vocational Association and of the Minnesota Industrial Arts Association. In 1957 he served as chairman of the National Conference of State and Local Supervisors of Industrial Arts.

Dr. Worthington served as a member of the Ford Industrial Arts Awards Advisory Council and as a judge in drafting at the International I.A.A. Finals. He was a member of the President's Conference on occupational safety. He is a member of Phi Delta Kappa and Iota Lambda Sigma honoraries and numerous professional education organizations.

DR. LANDIS COMPLETES LIBRARY VISITS

Dr. Russel H. Landis, a professor in the industrial arts department of Eastern Illinois University, Charleston, Ill., has returned to duty following a leave of absence during the Fall Term, 1958. He visited a number of university libraries for the purpose of studying noted collections in the area of graphic arts. He reports that considerable information was obtained from the study of these source materials which he hopes to include in his courses of study in printing on campus.

Among the schools visited were Rochester Institute of Technology, Syracuse University, Vassar College, Columbia University, Harvard University, University of Kentucky, University of North Carolina, and Emory University.

Dr. Landis reports that these visits were made in two trips; one going to the northeast part of the country and the other southeast. Mrs. Landis accompanied him and assisted in the investigation and study of the various collections.

In between the library visits Dr. and Mrs. Landis visited scenic places in the areas in which they were traveling.

Since returning to Charleston, Dr. Landis has been occupied with the writing of a workbook for use in his printing classes.

GROEBLI RECEIVES DOCTORATE

The completion of a five-year study of national educational organizations resulted in the conferral of the doctoral degree upon John M. Groebli, assistant professor of industrial arts at the University of California, Santa Barbara, Calif. The major area of study for Groebli's Doctor of Philosophy degree was educational curriculum and his minor field was psychology.

The doctoral dissertation examines the place of various groups in American society at the mid-twentieth century. It analyzes in particular the education profession and its 400 national and regional organizations, with more intensive analysis of the 15 largest educational societies. In the study, Dr. Groebli proposes a coordinating agency for all national organizations in education for the improvement of their operations, activities, and effectiveness.

A graduate of UCSB, Dr. Groebli received his M.A., at the University of Southern California and joined the faculty at UCSB in 1946. In 1957 he was added to the staff of the Dean of Students as assistant dean — dean of men in addition to his professorial duties.

TWO NEW DEANS AT STOUT

Dr. Ralph G. Iverson, since 1951 director of student personnel services at Stout State College, is now dean of student affairs, as announced by Dr. Verne C. Fryklund, president of the college.

It was announced also that Dr. Ray A. Wigen, former director of the graduate studies program, is now dean of graduate studies.

THE OHIO STATE UNIVERSITY INSTRUCTORS

Edward R. Towers, assistant professor of education at The Ohio State University, Columbus, left on January 19, 1959, for a two-year assignment in India. Dr. Towers has been appointed Chief of Party of a team of vocational educators from The Ohio State University who will work with the All India Council for Secondary Education to consider ways of developing multi-purpose secondary schools in that country. The project is administered by the International Cooperation Agency (ICA).

He will be headquartered in New Delhi for two years, and will return for duty at Ohio State in January of 1961.

John R. McElheny, formerly an instructor in the program, recently matriculated for the Ph.D. degree and has returned to his duties as chairman of the Department of Industrial Education at the University of Miami at Coral Gables, Fla.

Fred A. Olsen, formerly a teacher of industrial arts in the public schools of Seattle, Wash., has joined the staff temporarily to pursue the Ph.D. degree and serve as an instructor in the area.

Robert G. Thrower has joined the area staff temporarily as an instructor. He is beginning work on a Ph.D. degree. He was formerly employed as an industrial-arts instructor in the public schools of Charlotte, N. C.

CHIPPENDALE, FORMER TEACHER DIES

Rev. Thomas Chippendale, scion of the famous furniture designer, well-known teacher, churchman, and craftsman in his own right, died at the age of 73, November 10, 1958, at Vancouver, B. C., Canada.

He was fifth in descent in the family of furniture craftsmen, and located in the British Columbia city of Vancouver in 1912. After teaching woodworking and mathematics at Magee High School for 14 years, he retired at the age of 65 and started a new career as a priest in the Anglican church.

He received a degree from Oregon State College in June, 1941, was an honored member of Epsilon Pi Tau, and is reported to have been one of the founders of the Vancouver Technical School.

News Notes

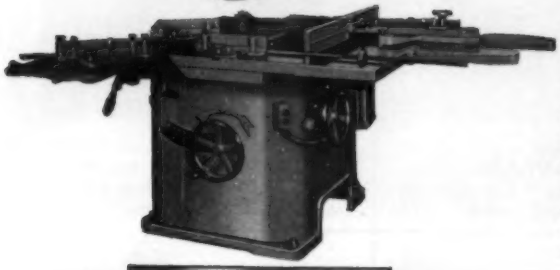
TEACHING AIDS FOR MECHANICAL DRAFTING

An exhibit of mechanical drafting teaching aids was one of the highlights of the recent Education Day activities at Wayne State University on November 13. This exhibit sponsored by the Department of Industrial Education was viewed by many of the guests after the departmental luncheon on Education Day. It was held in the Wayne State General Li-

(Continued on page 28A)

You'll like *Northfield* woodworking machines in YOUR school shop!

You'll like them for their heavy, vibration-free, smooth running. Each machine is electronically balanced. You'll like their dependability, the freedom from trouble, their excellent safety features. And yes, you'll like the price too. Take all these factors into consideration and compare NORTHFIELD with any others before you buy.



The Northfield NO. 4 VARIETY SAW

Tilting Arbor Type

The NORTHFIELD No. 4 Variety Saw is a carefully designed, quality machine with the latest features. It offers maximum versatility for all around sawing in any school shop. In addition to wood it's adaptable for cutting light metals, plastics, and other materials. The table on the basic machine is 44" x 36", plus a 19½" extension for carrying the rip gauge table. One or more 12" table extensions can be furnished to increase table size. A rolling section table is also available. You'll like this machine for its versatility, heavy duty capacity, ease of handling, and speed with precision.

Northfield HAND JOINTERS

These jointers are of the type the student will encounter later being used for production work where accuracy and fine quality of work are essential. Working surfaces are convenient to the operator. Weight is well distributed to make a well balanced smooth operating machine. The medium duty machine at right is available in eight and twelve inch widths. Tables are 6'2" long; rabbet depth ⅛". Heavy duty jointers are available in 12" and 16" sizes. Tables are 8' long; rabbet depth ⅝". They use a round three or four knife, safety type cylinder head, and a three horsepower, 3600 R.P.M. T.E.F.C. motor; five H.P. motors and belt drive machines also available.

WRITE TODAY FOR LITERATURE AND PRICES

20" BANDSAW

Northfield

FOUNDRY & MACHINE CO.
NORTHFIELD | MINNESOTA

SHAPER

36" BANDSAW (REAR VIEW)

SURFACERS

Northfield BAND SAWS

are available in 20", 27", 32" and 36" sizes. The 20" band saw takes 24" x 36" in floor space, horizontal capacity is 20", vertical capacity under guide is 11".

Manufacturers of High Speed Precision Heavy Duty Woodworking Equipment

Northfield SURFACERS

are ideal for school shops. They have simplified, high performance, trouble-free, mechanical design. They are available in 18" x 8" and 24" x 6" sizes.

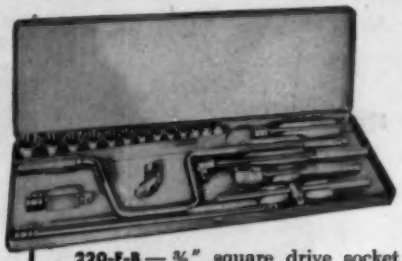
(For more information from advertisers, use the postcard on page 91A)

Snap-on

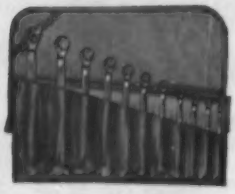
CAREER TOOLS

for school shop training

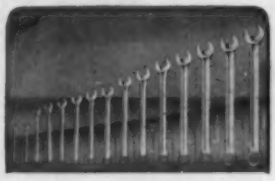
Train your students with *Snap-on* tools and give them the full benefit of shop instruction. Send them to their first jobs with a full knowledge of the tools used by most top-flight mechanics.



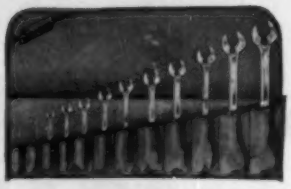
220-F-8 — ⅜" square drive socket wrench set — 20 matched units for tight places, hard-to-reach nuts. Many other sets available.



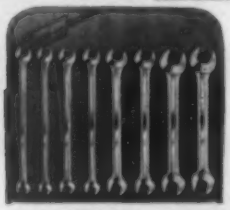
XV-611-K — 11 offset Boxocket® wrenches from ⅜" to 1¼". Knuckle-saving clearance, powerful leverage.



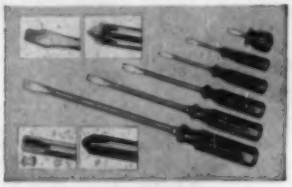
OEX-715-K — 15 Combination wrenches from 5/16" to 1¼". Combines safe Boxocket® leverage and open end nut-turning speed.



OE-812-K — 12 Open-End wrenches from ¼" to 1⅛". Covers practically every nut-turning job in automotive and tractor repair.



LTA-808-K — 4 pairs of wrenches for every tappet job. Sizes 7/16" to ⅞". Thin heads and long handles provide both speed and safety.

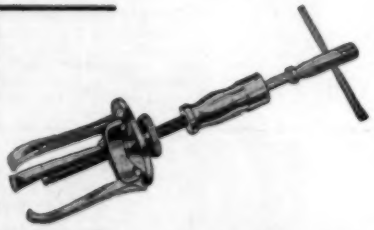


SNAP-ON SCREW DRIVERS — sizes and blade tips for every job. Shock-proof handles, tough well-anchored blades.

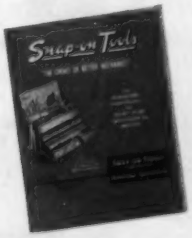
SNAP-ON PLIERS — built to last longer and work better. Grippers, cutters, needle-nose and specials.

PC-170-K — set of 17 chisels and punches. Gives you the right size and type for practically every job.

MT-318-B — motor tune-up set with 18 units to tell young mechanics what's wrong with a motor.



CG-273-H — 3-jaw medium size slide hammer puller for safe, uniform pulling of wheels, gears, etc.

TORQOMETER WRENCHES—25 models, 0-30 in. lb to 0-4000 ft lb tell specified tensions as easy as telling time.

Detailed information and illustrations of all *Snap-on* tools are included in catalog "W". Write for your copy listing over 4,000 quality tools for school shop training.

SNAP-ON TOOLS
CORPORATION
8074-C 28th Avenue • Kenosha, Wisconsin

(For more information from advertisers, use the postcard on page 91A)

Now, train your students on the complete woodworking tool!

STREAMLINED DESIGN—full 1 HP motor, yet tool weighs just a little under 7 pounds.

MORE ACCURATE — exclusive micrometer-type depth adjustment with calibrated depth dial speeds accurate positioning.

EASIER HANDLING — specially designed handles fit palm of hand. Switch operates without releasing handles.

FASTER CHANGING—tool stands on end for fast changing or sharpening of bits and cutters, adjusting for cutting depth.

Mail coupon for free demonstration of the lightest, most compact 1 HP Router

Now your students can do beading, grooving, routing, fluting, inlay work—a flock of jobs—faster with the easier-handling new Black & Decker 1 HP Heavy-Duty Router! Here's a maximum of power packed into a minimum of weight—a tool that sets new standards of precision—perfect for fast finishing. And a clearly illustrated manual is included with each tool for project ideas and helpful operation tips.

See for yourself how the Router your students will use on the job can help your training now. Mail coupon today for additional information or a free demonstration to: THE BLACK & DECKER MFG. Co., Dept. 4502, Towson 4, Md. (In Canada Brockville, Ont.)

Look Under "TOOLS-ELECTRIC" in Yellow Pages

Leading Distributors Everywhere Sell

B&D **Black & Decker®**

Quality Electric Tools—Power-built but streamlined

▶ MAIL TODAY FOR FREE DEMONSTRATION ◀

The Black & Decker Mfg. Co., Dept. 4502, Towson 4, Md.

☐ Send additional literature ☐ Arrange for free demonstration

Name..... Title.....

School.....

Address.....

City..... Zone..... State.....

For Most Effective Teaching . . .

McKNIGHT'S PRACTICAL SHOP BOOKS

- **Improve Student Work by Showing Them HOW**
- **Answer Student Questions by Telling Them WHY**

FEATURE BOOK FOR THE MONTH

HANDBOOK OF DRAFTING RULES AND PRINCIPLES

#73 **By Nelson**

Here's a brand new handbook that proves valuable as a brief source of practical information, a standard for drafting room practice, an aid in correcting drawings, as well as useful selection of subject matter used in the instruction of drafting. Equally important is the fact that each drafting rule and principle is explained; and adjacent, detailed instructions further simplify application instructions. 151 illustrations. The 96 pages are broken down into sections on (1) Use of Drawing Tools, Lines; (2) Dimensions; (3) Lettering, Inking, Drawing; (4) Pictorial Drawing.

List price, $2.00

ADDITIONAL SHOP BOOKS

AUTO MECHANICS	
Understanding Your Car #82	$ 1.60
DRAFTING	
Applied Drawing and Design #43	est. 4.00
Blueprint Reading, Checking and Testing #17 Part I	1.20
Part II	1.20
Blueprint Reading and Sketching #14	1.00
General Drafting #15	1.50
Graphic Architectural Drafting #60	4.80
A Handbook of Drafting Rules and Principles #73	2.00
Introduction to Applied Drawing #28	1.00
ELECTRICITY	
General Electricity #13	1.50
Principles of Electricity #9	4.00
Projects in Electricity #12	1.25
ELECTRONICS	
Experimental Basic Electronics #84	3.00
FORGING — WELDING	
Gas and A.C. Arc Welding and Cutting #36	1.50
Forging and Welding #37	3.60
LEATHERCRAFT	
General Leathercraft #75	1.50
METALWORKING	
Machining of Metal #33	3.60
Sheet Metalwork #39	1.25
Etching, Spinning, Raising and Tooling Metal #41	1.50
METALWORK DESIGN	
Contemporary Metal Home Furnishings #69	2.50
METALWORK PROJECTS	
Practical Metal Projects #66	2.50
Projects in Sheet Metalwork #94	in works
Contemporary Metal Home Furnishings #69	2.50
PRINTING	
General Printing #7	3.00
PLASTICS	
General Plastics #79	1.80
TEACHING	
Teaching Successfully the Industrial Arts & Vocational Subjects #55	4.50
Teaching Multiple Activities in Industrial Education #56	5.00
WOODWORKING	
Machine Woodworking #2	3.60
Finishing Materials and Methods #26	4.00

GENERAL SHOP BENCH WOODWORKING

#1 **Revised 1955 — By Fryklund and LaBerge**

Covers the basic fundamentals of hand woodworking. Instructions on basic handtool operations. 387 "show-how" drawings and pictures illustrate information topics, give details of techniques. Valuable technical and related information. All about tools and how to use them. Types of occupations, sources of wood processing.

CLOTH BOUND, $3.00 **PAPER BOUND, $1.50**

GENERAL SHOP ELECTRICITY

#8 **By Dragoo and Porter**

Beginner's text in practical electricity. Includes 26 practical projects to demonstrate applications of electrical theory with explanations of how and why each works. Projects include radio construction and usable home appliances. Many illustrations.

$1.50

METALWORK TECHNOLOGY AND PRACTICE

#31 **Revised 1955 — By O. A. Ludwig**

An entirely new revision of the most complete general metalwork textbook ever published. Text describes tools, materials and operations common to many metalworking occupations. 662 illustrations make it interesting and useful for high school and junior high use. Huge index with over 4,000 entries, completely cross-referenced.

400 PAGES **CLOTH BOUND, $4.80**

#49 STUDENT STUDY GUIDE 120 PAGES, $1.25

GENERAL SHOP METALWORK

#30 **Revised 1947 Edition**

By Alva W. Dragoo

Short teaching units cover work in beginning bench metal, sheet metal, art metal, and ornamental metal. Includes designs and directions for twenty-eight projects of a practical, usable nature, which gives the student practice in the operations while he is making something of real value.

104 PAGES **$1.40**

McKNIGHT & McKNIGHT

PUBLISHING COMPANY • BLOOMINGTON, ILL.

Dept. No. 621

FREE 30-DAY APPROVAL

McKNIGHT & McKNIGHT, Dept. 621, Bloomington, Ill.

Send me your NEW FREE CATALOG and the books circled for 30-day approval.

1	2	7	8	9	12	13	14	15	17	26
28	30	31	33	36	37	39	41	43	49	55
56	60	66	69	73	75	79	82	84	94	

Name .....

School .....

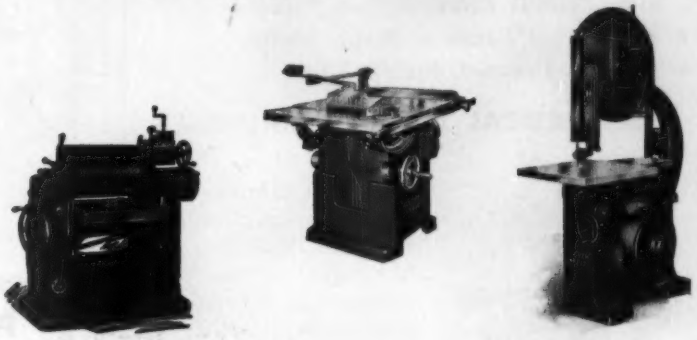
Address .....

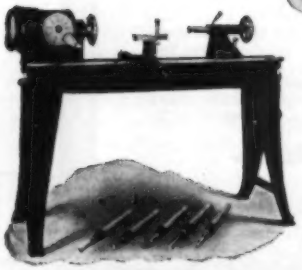
City ..... Zone ..... State .....

(For more information from advertisers, use the postcard on page 91A)

Woodworking Shop of Sandusky High School, Sandusky, Ohio

In vocational shops, too... buy Oliver equipment once and you'll buy it again!





The value of sturdy, precision-built woodworking equipment for sound vocational training proves itself daily to instructors and directors throughout the states. The many refinements of Oliver machines make efforts of instructors most effective. In no time students learn to set up these machines quickly and accurately. Moreover, Oliver machines are the safest to operate. A few of the complete line of Oliver machines for woodworking shops are shown here.

Oliver equipment for vocational shops...

Band Saws	Saw Benches	Tenoner	Surfacers
Mortisers	Cut-Off Saws	Jointers	Oilstone Tool Grinders
Shapers	Woodturning Lathes	Jig Saw	Disk and Belt Sanders
Borers	Metal Spinning Lathes	Wood Trimmers	Benches and Vises

Write for bulletins on machines that interest you.

OLIVER
SINCE 1890

OLIVER MACHINERY COMPANY
Grand Rapids 2, Michigan

(For more information from advertisers, use the postcard on page 91A)

DESIGNED

to teach basic machining skills with minimum investment

U.S.—BURKE Milling Machines offer ease of instruction on all standard milling operations, help teach fundamental principles through duplication of actual shop operations in miniature.

- **Perform All Standard Milling Operations**
- **Simple Operation Increases Value as Instructive Aids, Permits Practical Shop Teaching**
- **Within Cost Range of School Shops**
- **Accuracy Certified, Rigidly Built**

U.S. VERTICAL MILLING MACHINES

U.S. Vertical Mills—Fine grain alloy steel spindle • Spindle bearings prelubricated, sealed • 24 spindle speeds: 65 to 2850 RPM • 7" head travel • 1 HP drive • Many optional features, including powerfeed to head and table, etc.

BURKE BENCH MILLERS

Burke Bench Millers — 2 hand, 2 power feed models. #9 B & S. Taper • Heat treated, ground-spindle mounts in Timken bearings • ½ HP standard or gearhead, or ¾ HP Lima motor • 3 spindle speeds with standard, 12 with Lima motor • Range 66 to 2875 RPM depending on motor selected.

WRITE FOR FULL INFORMATION AND QUOTATION

U·S·Burke MACHINE TOOL DIV.
39 BROTHERTON ROAD
CINCINNATI 27, OHIO

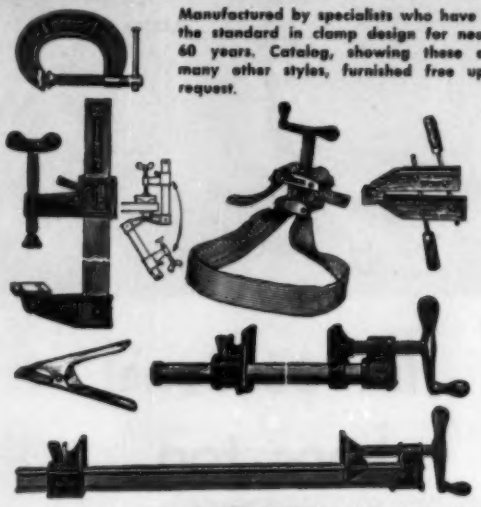
"Jorgensen" TRADE MARK REG U S PAT OFF

and

TRADE "Pony" REG. MARK U. S. PAT. OFF.

CLAMPS

Manufactured by specialists who have set the standard in clamp design for nearly 60 years. Catalog, showing these and many other styles, furnished free upon request.



the clamp folks | **ADJUSTABLE CLAMP CO.**
424 N. Ashland Ave., Chicago 22, Ill.

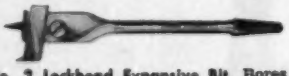
New IRWIN Bit

lets you dial your size

Now bore 35 standard hole sizes with just one tool

Here is the new Irwin wood boring tool that does the work of a whole box full of individual sizes. And it costs much less, too. Just the easy turn of Irwin's patented Micro-Dial and it's set to go! No hunting, no fumbling for the size you need. No slow down of School Shop work. Clean, fast, accurate boring action in any wood. Fits all hand bit braces.

And the new Irwin Micro-Dial is built to deliver the longest possible service in your shop. It's drop-forged from special bit steel, heat treated full length, precision machined for accuracy and sharpness. Highly polished, too. Two cutters supplied with each bit. Replacement cutters also available. Put the Irwin Micro-Dial Expansive Bit on your requisition list today. No. 21 bores ⅝" to 1¾" and No. 22 bores ⅞" to 3".



No. 2 Lockhead Expansive Bit. Bores 35 standard holes, ⅞" to 3". Solid clamping device holds blade securely. Also available in No. 1 size which bores ⅝" to 1½". only **$3.45** ⅝" to 3" size

No. 22 Micro-Dial only $3.80 ⅞" to 3" boring range

IRWIN the original solid center auger bit
•
Wilmington, Ohio screw drivers — screw driver bits

(For more information from advertisers, use the postcard on page 91A)

New Design Power Tools with Extra Features, Extra Quality ...at a Budget Price!

Every major feature . . . instructors have been looking for . . . has been included in the 1959 Duro Power Tool Line. Each tool incorporates basic improvements designed to simplify operation and permit students to produce quality work in less time, with less effort—in safety! Important too, their low price makes it possible for every school to fully equip their woodworking shop and still remain within limited budgets.

The Duro line is recognized as the No. 1 power tool buy in America, offering more exclusive "extras" than any other. You get "built in" rigidity, lifetime ruggedness, "years ahead" design, unique safety features, precision accuracy PLUS an extra capacity *at no extra cost!* If you want finest quality—Duro is your best bet. If performance is your prime requirement—choose Duro. If price is *the* factor—Duro will give you more, much more, for less! Get the facts today!

GET ALL 3 FREE

1. BIG 44 page catalog shows the DURO line and accessories.
2. Plan-A-Shop booklet gives interesting data on developing a workshop to your floor plan.
3. Comparative Chart reveals important figures on Duro Power Tools as compared to other advertised brands.

DURO
METAL PRODUCTS COMPANY
2683 N. Kildare Ave. • Chicago, Illinois

DURO METAL PRODUCTS COMPANY
2683 N. KILDARE—CHICAGO 39, ILL.

Gentlemen: Please rush me the following FREE literature:

☐ Big Power Tool Catalog ☐ Plan-A-Shop Booklet
☐ Comparative Chart

Name_____

School_____

Address_____

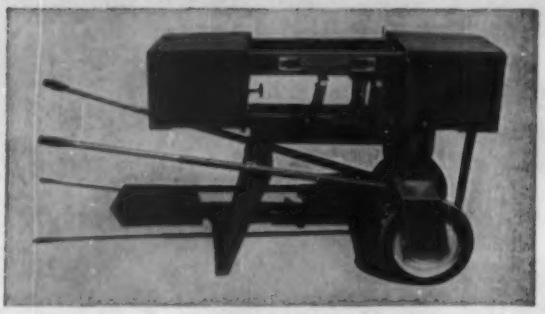
City_____ Zone____ State_____

The World's Largest Manufacturers of Power and Hand Tools (Duro-Chrome)

(For more information from advertisers, use the postcard on page 91A)

TAKE IT TO THE JOB...

KALAMOBILE —a metal-cutting band saw that's truly portable—handier than ever!

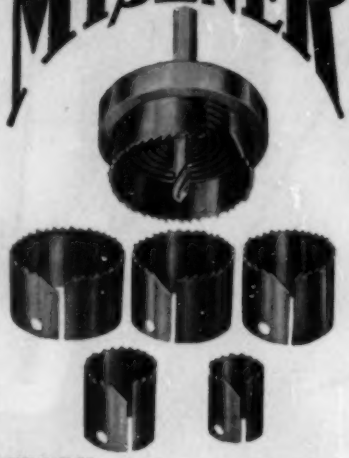


Here's the popular Kalamazoo Model 610 metal-cutting band saw on the handiest chassis you ever saw. Provides greatly increased portability with its rubber-tired 12-inch wheels and telescoping handles. One man shifts the 610 from job to job with ease. Capacity 6" Rounds—10" Flat.

610-D without coolant attachment.
610-W with coolant attachment.
Kalamobile chassis M6A fits all 610 models.

MACHINE TOOL DIVISION
Kalamazoo TANK and SILO CO.
359 Harrison St., Kalamazoo, Mich.

The ORIGINAL SAW-For Every Purpose
MISENER



TEACH efficient, low-cost Modern **HOLE-CUTTING** in Steel, Sheet Metals, Castings, Wood, Plastics, Wallboard, and many other materials with versatile

"HOLE-MASTER"
MULTI-BLADE HOLE SAWS
MADE ONLY BY MISENER

HOLE SAWS

Illustrated is a MISENER "HOLE-MASTER"
No. 3—¾" to 2¼" ¼" var. 7 Sizes
No. 1—1" to 3½" ¼" var. 11 Sizes
No. 7—2" to 7" ½" var. 11 Sizes

SINGLE CUT HOLE SAWS
Fractional Diameters
5/8" to 15"
COARSE TOOTH BLADES FOR WOOD
1¼", 2", 2½" depths of cut.

Send for—
FREE CATALOG

MISENER MFG. CO., INC.
202-8 WALTON STREET
SYRACUSE, NEW YORK

SAMS BOOKS
...have the classroom in mind

MOST WIDELY USED PUBLICATIONS FOR EFFECTIVE INSTRUCTION IN:
- Television
- Radio
- Electronics
- Electricity

Ideal for your classroom
- LEARNING ELECTRICITY FUNDAMENTALS.....EFC-1
- BASIC ELECTRICITY MANUAL.....ED-12
- BASIC RADIO MANUAL.....ED-1
- BASIC TELEVISION MANUAL.....ED-21
- PHOTOFACT TELEVISION COURSE.....TV-1
- COLOR TV TRAINING MANUAL.....TVC-1
- RADIO RECEIVER SERVICING.....RS-1
- TV SERVICING GUIDE.....SGS-1
- KNOW YOUR OSCILLOSCOPE.....KOS-1
- 101 WAYS TO USE YOUR SIGNAL GENERATOR..TEM-1
- HANDBOOK OF ELECTRONIC CIRCUITS.....HEC-1

Student Notebook Sheets—RADIO.....VLV-1
Student Notebook Sheets—TELEVISION..VLV-2

FREE TO INSTRUCTORS
Send coupon at right for Free INSTRUCTOR'S PACKET ED-8 containing Wall-sized Block Diagrams of TV and Radio, latest Test Equipment Data, Planning Information, descriptions of new Radio and TV Student Notebook Sheets, and Free Book List.

ORDER TODAY! 30-DAY APPROVAL ON ALL SAMS PUBLICATIONS

HOWARD W. SAMS & CO., INC.
2216 E. 46TH STREET • INDIANAPOLIS 5, INDIANA
Send me the following books (with 30-day return privilege):

☐ EFC-1....$5.95	☐ TV-1.....$3.00	☐ TEM-1....$2.00
☐ ED-12.... 5.00	☐ TVC-1.... 6.95	☐ KOS-1.... 2.00
☐ ED-1..... 5.00	☐ RS-1..... 2.50	☐ HEC-1.... 1.00
☐ ED-21.... 5.00	☐ SGS-1.... 2.00	☐ VLV-1..... .25
		☐ VLV-2.... .35

☐ Free Instructor's Packet ED-8.

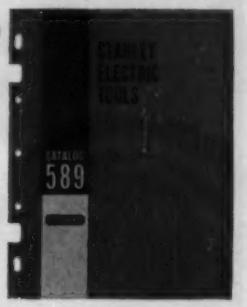
$_____ enclosed. ☐ Bill as instructed

Name_____
Position_____ Subject-Field_____
School_____
Address_____
City_____ Zone____ State_____

(For more information from advertisers, use the postcard on page 91A)

STANLEY SHOP TALK

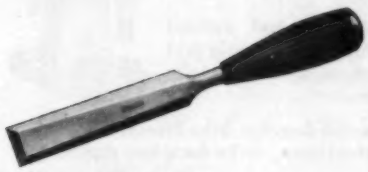
Tool Catalog No. 34 **Electric Tool Catalog No. 589**



These Stanley Catalogs are particularly useful books of reference for the school shop instructor and supervisor. Special information has been added for your use, and the catalogs are packed with details that make best selection for school use easy.

Use the coupon to send for your free copies of both catalogs. Catalog No. 34 has a special school index based upon Stanley's long experience and the advice of educators. We will also include a 9-page list entitled *"Suggested Specifications for Equipping a General Shop."*

"BOY-PROOF" HAND TOOLS



NO. 40 WOOD CHISEL

This sturdy chisel has 4½" one-piece alloy steel blade and tough plastic handle permanently attached. Complete range of sizes. Trouble-free tool with long useful life in school shops.

NO. 118 BLOCK PLANE

An all-steel, low angle block plane, this Stanley "100 PLUS" tool consists of only 3 pieces and the locked-in cutter adjustment prevents thread stripping or lost parts.

NO. 610 HAND DRILL

This hand drill has enclosed gears for maximum safety, a solid handle and a chuck that cannot come off the spindle. Jaw springs protected.

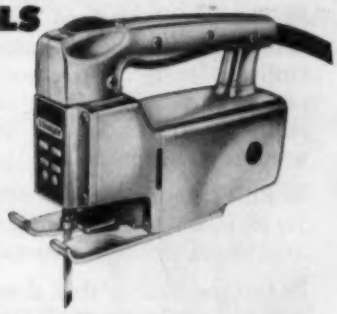
HEAVY DUTY ELECTRIC TOOLS

H264 ROUTER

This ⅞ hp Stanley Router is packed with many new features. Safe Switch-Shaft Lock starts and stops router and automatically locks shaft. Spot Light lights the way along the work.

H31 BELT SANDER

The Stanley Belt Sander takes the work out of sanding, whether it's for rough sanding or fine finishing of wood, metal or plastic. Easy to change 3" x 24" belts.



H75 SABRE SAW

The sabre saw is a versatile portable saw furnished with three blades and eighteen more to select for every use. It will rip, crosscut or jig saw and will also cut plastics, rubber and metal.

Use this coupon for more detailed information and school shop help

STANLEY®

STANLEY TOOLS, Educational Dept.,
473 Elm Street, New Britain, Conn.

FREE ( ) Please send me Stanley Tool Catalog No. 34
FREE ( ) Please send me the Stanley Electric Tool Catalog 589

Name .....
Subject you teach .....
School .....
Address .....
City ..... Zone ..... State .....

(For more information from advertisers, use the postcard on page 91A)

SKIL 3/8" DRILL

- full 3 amp. power
- new side handle for ease of control

■ The popular-priced Skil 3/8" Model 560 drill is safer to use because it can be controlled so easily. The removable side handle makes it possible for even the youngest students to tackle any drilling job with accuracy and precision.

■ Full 3 amp. motor provides extra power for all jobs—including larger diameter holes and tough drilling in metal.

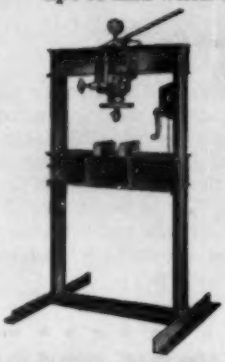
■ See the Skil 3/8" drill demonstrated soon. You will welcome such features as double reduction gearing, oversize fan for cooler operation, and extreme light weight—features that add up to the safest, most powerful drill for school shop use.

SKIL ...another Skil basic school shop tool

Famous SKIL and SKILSAW products made only by SKIL Corporation, 5033 Elston Ave., Chicago 30, Illinois

DAKE PRESSES for School Shops

Shop training is most helpful when your pupils use the same practical presses they are apt to find when they work after graduation.



DAKE HYDRAULIC PRESS Model 25 H

Includes pressure gauge, hand wheel for rapid advance, automatic ram return, and table lifting device. 25 tons capacity.

DAKE ARBOR PRESSES

Have large opening and slotted table plates. Available in single and compound leverages, with capacities from 1 to 25 tons.

Catalog No. 350 describes Dake Presses suitable for school shops. Write for a free copy.

DAKE CORPORATION 653 Robbins Road Grand Haven, Mich.

ARMSTRONG

Teach with the tools actually used in industry with ARMSTRONG TOOL HOLDERS — used in over 96% of the Machine Shops and Tool Rooms. A complete system of Tool Holders comprising over 250 sizes and shapes. Develop "tool sense" and a love for fine tools with ARMSTRONG Drop Forged WRENCHES — Hi-Ten and Armaloy Steel Open End Wrenches; Box Socket and Detachable Socket Wrenches with improved designs, better balance, finer machining and finish. Set up jobs with modern, safe ARMSTRONG Drop Forged Setting-Up Tools. Use ARMSTRONG Drop Forged Clamps that never slip, spring or spread, and ARMSTRONG Drop Forge Lathe Dogs that are standard everywhere.

Write for Catalog and Cutter Grinding Charts, sent upon request to Instructors.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5222 W. ARMSTRONG AVE. CHICAGO 46, U.S.A.

(For more information from advertisers, use the postcard on page 91A)

Starrett

BASIC TOOLS for SCHOOL SHOPS

These professional quality tool chests are designed and built to Starrett toolmaker specifications — in ruggedly finished, rigidly reinforced steel or hand-rubbed Honduras mahogany. Available now through Starrett distributors without tools or with three different assortments of Starrett Tools selected to provide basic, intermediate or advanced precision measuring equipment for students and apprentices of all grades as well as working machinists and tool and die makers.

Metal Chest No. 200MC Size 20 x 8½ x 13¾ with top compartment and seven drawers felt lined. Front panel locks with top, slides under bottom drawer when open. Complete with 21 tools.

Wood Chest No. 300WC Size 20 x 9½ x 13 with top compartment and nine drawers felt lined. Front panel locks with top or slides under bottom drawer. Complete with 21 tools.

No. 11 Combination Square with Center Head has easy-to-clean black wrinkle finish. Available in 4, 6, 9, 12-inch and larger sizes.

6, 12, 18 and 24-inch steel rules with Satin Chrome Finish (pioneered by Starrett). Flexible or spring tempered types, fractional or decimal graduations.

No. 56 Surface Gage for use on round work or flat surfaces has 2½" base, 4" or 7" spindle, gage pins in base, fine adjusting screw.

No. 117 Center Punches are hardened on both ends for safety and long life. Made with round shank, knurled grip, accurately centered tips.

FREE EDUCATIONAL AIDS

New Bulletin 1203, "How to Read, Use, Care for Micrometers and Vernier Gages."

Training Aids Bulletin No. 1202 shows the complete line of Starrett training aids.

Big new Catalog No. 27 shows the complete line of Starrett tools. Write for free copies. Address Dept. (CE), The L. S. Starrett Company, Athol, Massachusetts, U.S.A.

Starrett Tool Oil is made to our specifications and used by us to protect and preserve tools and instruments. Handy 3¼ fl. oz. can.

"Kleenscribe" Layout Dye is a quick drying, easy-to-use blue layout dye in a practical small container. 4 fl. oz. can with brush in cap.

Starrett

Buy through your Industrial Distributor — Prompt delivery, Dependable service, Quality products

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

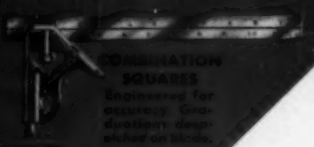
(For more information from advertisers, use the postcard on page 91A)

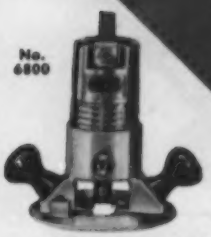
LOOK FOR THIS Mark of Superiority
ON ALL TOOLS FOR HOME AND INDUSTRY!

MILLERS FALLS TOOLS

SINCE 1868 ®

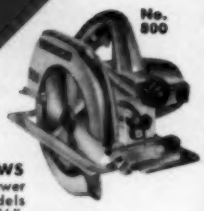
BLU-MOL





No. 6800

ROUTER-PLANE-SHAPER
Professional performance at low cost. Complete line of accessories. Revolutionary M-2 high speed steel bits.



No. 800

ELECTRIC SAWS
All-new full-power line. Five models from 6½" to 8¼".

No. 580

ORBITAL SANDER
This powerful, smooth-running, fine-finish sander is twelve times faster than hand sanding.

No. 888

"888" POWER TOOL
Rugged 1/3 h.p. unit. Powers inexpensive attachments to make up a 16-tool power workshop.

No. 480

No. 2860

DRIVER-DRILL
A Millers Falls first. High-torque, reversing screwdriver and ⅜" drill — all in one tool.

JIG SAW
Cuts wood or metal. Exclusive "angle" blade makes it fastest-cutting jig saw in its field.

New 1114 POWER DRILL

The drill that drives a workshop!

With full 2.7 amp. motor and geared to 2250 RPM for high torque, this versatile new drill drives matched attachments to make a complete 14-tool workshop including: 5½" Portable Circular Saw, Orbital Sander, Jig Saw, 6" Bench Sander, 4" Bench Grinder, Drill Press, Floor Polisher, and Hedge Trimmer.

Patterned after the famous "888" Power Workshop, it makes it possible to own a wide variety of efficient power tools at far less than the cost of separate, individually powered units.

The Millers Falls name stands for quality tools of all kinds, and the famous trademark is recognized by craftsmen everywhere. Look for this symbol of superiority on Hand Tools, Hacksaw Blades, Precision Tools and Electric Tools. Whatever your needs, you'll find them in Millers Falls *complete* line — the finest tools made for home and industry.

For further information write for free literature.

MILLERS FALLS COMPANY
Dept IA-44 Greenfield, Mass., U. S. A.

Industrial Arts and Vocational Education
The Shop Teachers Professional Magazine
MARCH 1959

Planning School Shops for Tomorrow

CHRIS H. GRONEMAN
Head of Industrial Education Department
and
Co-ordinator for Teacher Education
The Agricultural and Mechanical College of Texas
College Station, Tex.

The schools of this great nation have embarked on a terrific expansion in all fields of curricula, related activities, and physical facilities. Enrollment figures indicate a continued growth for many years to come, with no apparent decline or leveling off in sight. It has been only approximately a decade ago that school administrators were talking in terms of the past-war expansion and the need for thoughtful consideration of building programs. In many of the medium and large city systems, an individual was assigned the responsibility of analyzing the physical inventories and estimating the probable growth through a series of surveys. Educational research experts were employed in many areas to assist with such studies.

The entire expansion movement is one which cannot be postponed for any reason, because as children become of certain ages they are eligible to attend public and private institutions, and their progress is generally based on chronological sequence. Junior and senior high schools are already accommodating maximum enrollments, and it is not at all uncommon for a city of 500,000 to have at least 25 school buildings under construction, with additions planned for the existing plants.

Fig. 1. This energetic teacher is planning a new shop program with two dimensional cardboard cutouts on graph paper. This is one of the first steps in planning or replanning a shop or laboratory layout

One definite change in present-day planning, as compared with that of a generation ago, is the general inclusion of facilities for industrial arts and vocational-industrial education programs. There was a period of time when these curricula areas were considered as extras which would be nice to include but frequently were omitted in order to meet the available funds for building. Sometimes a wing or a separate building would be contemplated, however, these often gave way to other school considerations, or some school officials felt they met that need through the acquisition of war surplus buildings and equipment which generally were inadequate and not suited for school use.

Educational philosophy has changed to the extent that industrial shop facilities are not curtailed nor neglected in advance planning and building in the modern expansion programs. During the past decade, supervisors and consultants of industrial arts have been added to at least a dozen states, and they are now finding themselves pressed with this growing shift and expansion of educational opportunities. Teacher education programs are finding it necessary, in many instances, to specialize in shop planning and have someone available for the needs of school administrators and architects to foster a more intelligent planning of school shops, equipment layout, and selection of suitable and appropriate equipment and tools for educational use.

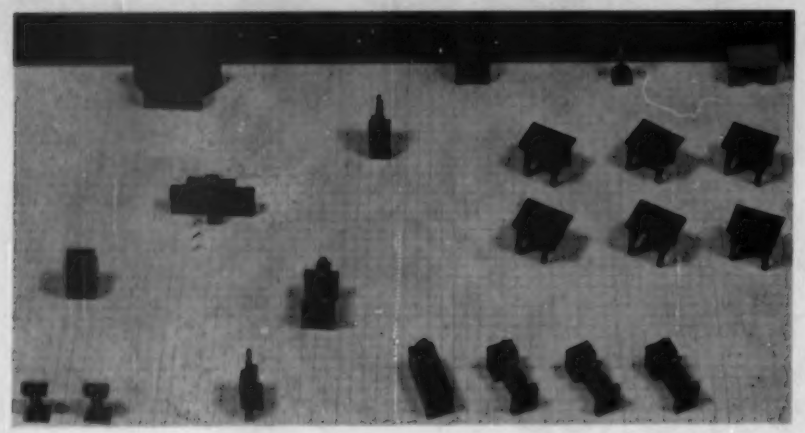


Fig. 2. Three-dimensional models provide excellent aids in shop planning

Not to be underestimated is the current "Do-it-yourself" movement which has prompted many school patrons to be more sympathetic toward the inclusion of industrial type subjects in the school program. As an individual tries to do something himself in the line of craft activity, he becomes aware of the need of good tools and adequate instruction, and in this manner the school public learns the necessity of sound industrial equipment in instruction. There is also a public awareness of a new facet for community endeavor which can be of service through the schools in the enriched adult education programs which are very common and prevalent in not only big city systems, but also in the small communities. Schools, through their industrial shop programs, are finding that adults are eager to learn that phase of education which was often omitted in their junior and senior high school offerings. Many adult programs are not concerned at all with occupational competence, but are endeavoring to satisfy an avocational desire of the parents in their communities.

Factors in Shop and Laboratory Planning

Any planning entails the thoughtful consideration of a number of factors before the reality is achieved. Those who make shop planning their specialty feel that an intelligent development of these factors involves a realization and interpretation of the guiding philosophy which has promoted the necessity for including industrial education as a phase of the general school program.

A natural development in this initial stage of planning sequence is the relationship of the industrial program to the thinking of the population of the community. This factor often determines the definite trend of the vocational-industrial program, and often has some effect on the type of industrial-arts offerings. It is only natural that the industrial development of the community becomes a consideration. Another stage in the evolution of a sound program is dependent on how inclusive the industrial program involves the levels of ages or grades; present and anticipated enrollment; and relation of the proposed industrial shop facilities to the remainder of the building, that is, whether it becomes a wing or perhaps a separate building. It is quite obvious that there must be one more stage in planning, and that usually is the definite paper work in which the shop size and proportion are determined; and the definite placement of facilities within or adjacent to the shop, including equipment, placement of the equipment, and planning of auxiliary room spaces.

Shop and Laboratory Areas

The location of the instructional areas in industrial education should, if at all possible, be on the ground level, due to the accommodations necessary for a drive-in or receiving double door for supplies, such as lumber, metal, and other cumbersome and heavy materials. The space for industrial instruction

Fig. 3. Metalworking is an area of a traditional nature which should be provided in school industrial planning. Fig. 4 (at right). Safety convenience should be provided for foundry practice in metalworking shops and laboratories

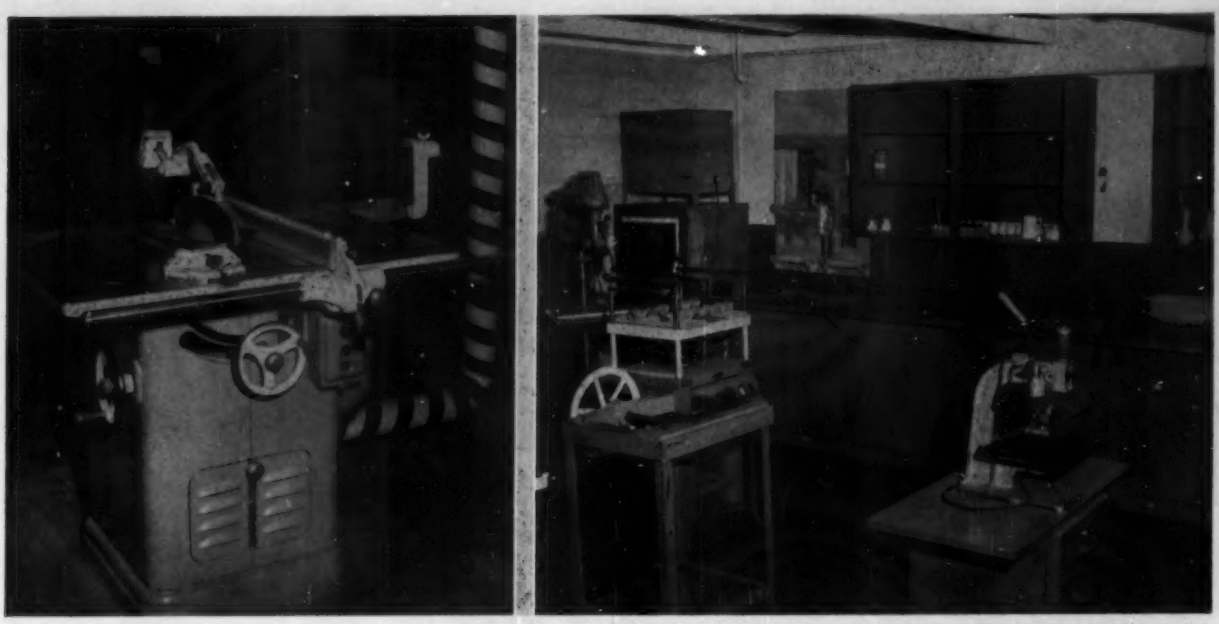


Fig. 5. Observance of safety with respect to guards, dust collecting systems and coloring play a very important part in school shop planning. Fig. 6 (at right). Various hand crafts are receiving great recognition, particularly in industrial-arts departments. Space should be provided for proper bench work and storage for these areas

should be so situated as to allow for future expansion. It is also desirable that initial planning should incorporate the fact that there will be noisy equipment; hence, the location should be in a separate wing or building away from the generally recognized academic instructional areas. This, however, should not mean isolation, but rather integration in such a way as not to disturb other school activities.

School shops and laboratories should be among the first instructional divisions of a school to receive acoustical treatment for auditory comfort of students within the shop, as well as for classrooms which may be adjacent to, or in the vicinity.

Present day architects give considerable thought to natural lighting and the direction of prevailing breezes. In some places it is felt, however, that the trend toward maximum natural lighting has included too much space for glass, which in certain areas of the nation increases the inside temperature due to the radiation factor of glass. Generally, a commonly accepted figure for natural lighting is 20 per cent of the floor area. Maximum window space should be recommended for the shady side exposure wall of the industrial wing or building.

Some instructional areas of industrial education have finishing booths, hot metals areas which produce fumes requiring ventilation, and transportation or automotive centers. The prevailing winds should be considered, and the shops so located that fumes can be carried away from other school buildings and from private property which might be near the school.

It has been noted that many new school plants are assigning the industrial education program to a wing, or wings, usually with the hall-type approach along the side of the wing for easy access by students to the several partitioned shops or laboratories within the wing. Where this is the case, it is advisable that the partition between the shops be of nonbearing type walls so that future expansion could make possible the removal of certain walls without impairing the structural strength or roof supports. In a few instances, the wings for shop activity have been lengthened or have had L-shaped extensions for expansion.

Services for lighting and heating should be so planned and constructed that they may be made to control relatively small areas within the shop. Artificial lighting has frequently been suggested to be 10 to 12 feet above the floor, which would mean approximately 12 to 14 foot height ceilings. It is advisable to secure assistance of recognized lighting engineers from utilities companies before recommending candle power over the various work stations. In practically every instance of lighting inspected in shops built previously to the present day expansion program, the lighting has been inadequate, thus resulting in eye strain. The Better Light Better Sight Bureau, 420 Lexington Avenue, New York 17, N. Y., is in a position to make general recommendations. Candle power ratings for shop or laboratory activity should not be less than 35, and over places where detailed work is done, either in construction or drafting, it is often recommended that there be at least fifty candle power.

Shop and laboratory space will vary in size according to the activities to be accommodated and the number of students who will be there at any given time. Usually, however, it is recommended that in shops and laboratories, including power machines, that the space should figure at 125 square feet per pupil. On the basis of an average class of 24, this would figure approximately 3000 square feet of open shop area. Where it becomes necessary to limit the space because of economic considerations, it has been found that 75 to 100 square feet per pupil can be satisfactory from the safety standpoint if thoughtful planning is given to the location of equipment and work stations. Here again, it would figure roughly 1800 to 2400 square feet of open shop area for the average class of 24 students.

Such instructional areas as drawing and the hand crafts can be accommodated with smaller space, such as 50 to 60 square feet per pupil, and figuring on the basis of 24 students, one should have at least 1200 to 1440 square feet of open drafting or draft laboratory area.

Fig. 7. Planning a place for unfinished projects must be included in housing of industrial departments. Fig. 8 (at right). The open tool panel with silhouette background is a satisfactory method of keeping and displaying tools. Underneath storage may be provided for surplus hand tools or portable power tools

Equipment Layout in Main Shop or Laboratory

Most industrial educators who have made studies on shop planning seem to agree that the ideal width to length ratio for a shop or laboratory is from 1:1½ to 1:2, and should be so situated that the instructor can survey the entire shop activity from any one point.

Frequently, the teacher must have an area he calls his headquarters; and this can be in the open shop area, or may be an auxiliary office space with clear glass windows for full visibility in the event he must check something in the office.

Equipment should be placed in such a manner that there will be a natural and logical sequence of material flow from one stage to the next. This comes under the category of time and motion study in industry. Aisles of travel should be at least 3 feet, preferably 4, in width, and the space between benches, machinery, and aisles should be 3 to 4 feet, sufficient for safety and free passage of students and materials.

The open tool panel and the check-out system tool room appear to be the two most common methods of handling the hand tool situation. In either case, there should be a clear floor space from 4 to 6 feet directly in front of the area where the tools are obtained.

The assembly of projects in most shop activities required that there be an open assembly area large enough for freedom of assembly and gluing by one or several students on the project.

All equipment, except for the portable type, should be fastened securely, otherwise there may be danger involved. Practically all manufacturers recommend that heavier types should be mounted so that they will be level. Each machine should be equipped with the start-stop fused type switch so that each can be controlled independently, and the switch box should be located within easy reach of the operator. Manufacturers almost always provide guards for all their equipment, and these should be installed as a protection to the student.

A wash station should be provided in each laboratory. Generally, it is advisable to employ the circular industrial type so that more students may be accommodated. It is also very convenient to have a drinking fountain to reduce the desire or need of the student to leave the shop or laboratory for a drink.

Every shop or laboratory should have fire extinguishers located conveniently near danger points, and they should be marked and labeled with instructions for their quick use. The local fire marshal should be consulted regarding the proper types of extinguishers to have and use.

A first aid kit is indispensable to students in the industrial shop or laboratory. It should be easily accessible and the instructor should give complete, detailed, and careful instruction on the proper use of the materials.

Auxiliary Rooms

School shop planning often does not include provisions for the tool room, supply room storage space, classroom or instructional area, office, finishing room or toilets. Every industrial shop or laboratory should have easy access to such auxiliary facilities. The size would be determined by the nature of the instructional activity, type and quantity of supplies, and the number of students.

Supply and storage areas should be so located that unloading from delivery trucks may be made easily and efficiently. All supply and storage rooms should have appropriate shelving or locker cabinets for storage of supplies, materials, and unfinished projects.

The finishing room should be properly protected with fire extinguishers, and wherever spray equipment is used, there should be an exhaust system.

Some shops and laboratories are equipped with instructional areas within them; however, most teachers prefer a separate classroom for related instruction. Where the latter is convenient, it is good to have the room so planned for the use of visual projection equipment.

Equipment Layout

Several of the leading tool and equipment manufacturers have made extensive studies and reports on efficient equipment placement and shop layout. These studies are available through printed bulletins and brochures to aid the shop planner in achieving a well-designed and efficiently located shop layout.

The bulletin, *School Shops for Today and Tomorrow,* by Delta Power Tool Division, Rockwell Manufacturing Company, 400 North Lexington Avenue, Pittsburgh 8, Pa., contains expert suggestions with respect to typical and ideal shop layouts which are the result of an international shop planning contest sponsored by that company in 1951 and 1952. All of the plans included in this bulletin are prize-winning entries in such categories as elementary schools, junior high schools, senior high schools, four-year high schools, technical high schools, vocational schools, technical in-

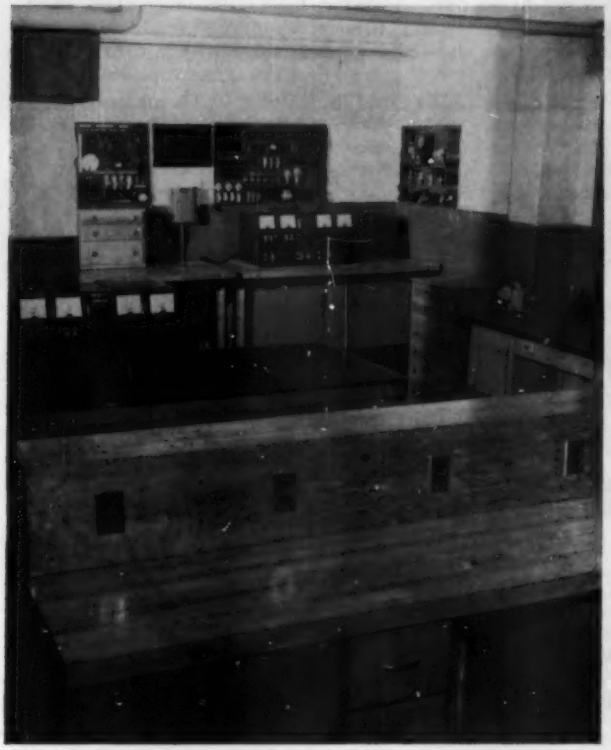


Fig. 9. Electricity and electronics are rapidly becoming essential areas which must receive careful consideration in the development of new or expanded programs. Fig 10 (at right). Vertical storage for lumber and metal

stitutes, farm shops, and occupational and recreational therapy. These are the result of the sound judgment and selection by five outstanding school shop planning specialists in the United States, and the plans give evidence that school shop planning is becoming a methodical procedure. In these various categories are the different types of shop, such as general, limited general, and unit. This brochure also includes some principles of machine arrangement, with respect to the worker, lighting, and adjacent machines. Considerable research has been entailed in arriving at the soundness of placing machines in the locations as suggested in the bulletin. Provision is also made for estimating budgets of the plans submitted. Specifications, accessories, planning principles, bibliography, and some auxiliary teaching aids by the Delta Company are included.

The *School Shop Planning Manual*, produced by the Education Department of the Walker-Turner Division, Rockwell Manufacturing Company, was released a few years ago to assist school people in developing some basic considerations in industrial programs and shop layouts. Terminology relative to industrial arts and vocational-industrial education is very aptly stated. Essentials and illustrations of shop planning principles are described and architectural details are defined in order to help school administrators and teachers understand phrases incorporated in architectural planning. Equipment lists are provided for the comprehensive general shop, metal fabrication area, power utilization, plastics, textiles fabrication, graphic arts, and woodwork areas. Scaled templates are printed on sturdy paper to allow for cutting out and placement or arrangement on graph paper floor layout in the above mentioned areas. This is a very comprehensive manual and should not be overlooked when planning for new programs.

Most recently, the E. H. Sheldon and Company, Muskegon, Mich., producers of laboratory furniture, have compiled *A Planning Kit For Industrial Arts* and a booklet, *Industrial Arts Equipment*. The materials in these publications include reference to types of shops to plan, student population, community demands, building conditions, recommended square footage for shops, and some planning essentials. The templates are cardboard sheets containing printed scale models of equipment, benches, storage facilities, and cases. Several sheets of graph paper for shop planning are included among the loose leaf facilities of this excellent check list planning kit.

The Bureau of Industrial Arts Education in the State Education Department of New York at Albany has just produced a very fine 64-page monograph entitled *Industrial Arts Shop Planning*. The authors from the State Department have prepared technical details for architects, superintendents of schools, boards of education, directors, supervisors, and teachers. It is divided into sections which pertain to the planning of shops, suggestions for organizing an industrial-arts program in proposed or existing buildings, and procedures and aids for developing shops. It is profusely illustrated with photographs and floor plans and generally provides excellent specifications.

Looking in on Ohio School Shops is a publication by the Ohio Industrial Arts Association and released through the State Department of Education in Columbus. Many teachers and administrators have contributed to such topics as: "Attracting Attention," "Holding Attention," "A Place for Everything," "To Help You Teach," and "Emphasizing Safety." This brochure is also very profusely illustrated with photographs and suitable forms which a teacher may use.

Other publications which have contained information for every shop planner are the magazines, INDUSTRIAL

ARTS AND VOCATIONAL EDUCATION and *School Shop*. These excellent sources have presented from time to time, shop planning articles which have been invaluable to the shop teacher in his planning. They have had at least one monthly issue annually devoted to shop planning and equipment selection, and the information is available to the teacher for only his looking up the particular issues.

Anyone interested in providing suitable and adequate shop and laboratory planning will certainly gain a better understanding of this vast problem if the above publications are consulted and evaluated before definite planning is developed. These publishers and manufacturers have spent much time, effort, and money by including the thinking of outstanding authorities in their publications, brochures, and planning kits. Writing directly to the publishers and sources mentioned is the proper way to obtain these materials. Generally, there is a small cost and this, too, can be obtained directly from the producer.

Cleveland's New Max S. Hayes Trade School

D. C. COURTRIGHT
Principal
Cleveland, Ohio

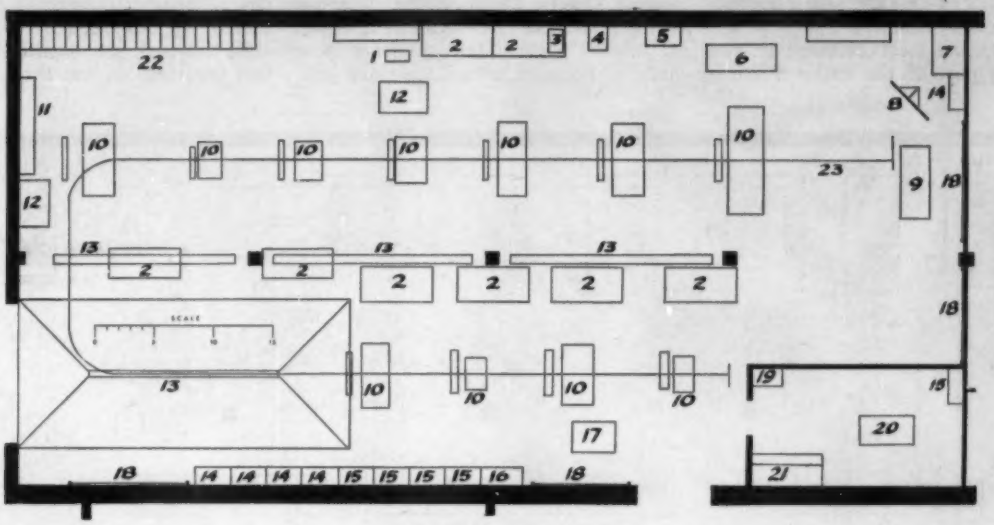
On October 29, 1957, the Max S. Hayes Trade School was dedicated with representatives of the schools, labor groups, trade associations, and the general public participating and in attendance.

To appreciate this structure of over 182,000 square feet and to understand why it is so laid out and designed one must first understand its training objectives. Three types of programs will continue to exist. The daytime apprentice program serving over 2500 apprentices in 22 trade areas including the construction, mechanical, and service trades. The evening trade extension or journeymen upgrading program currently enrolling over 1000 adults in some fifty classes. The vocational high school program with a future top enrollment of 800 high school age students enrolling in eight trade preparation areas.

Max S. Hayes Trade School
— Photo by Bureau of Visual Education, Cleveland Public Schools

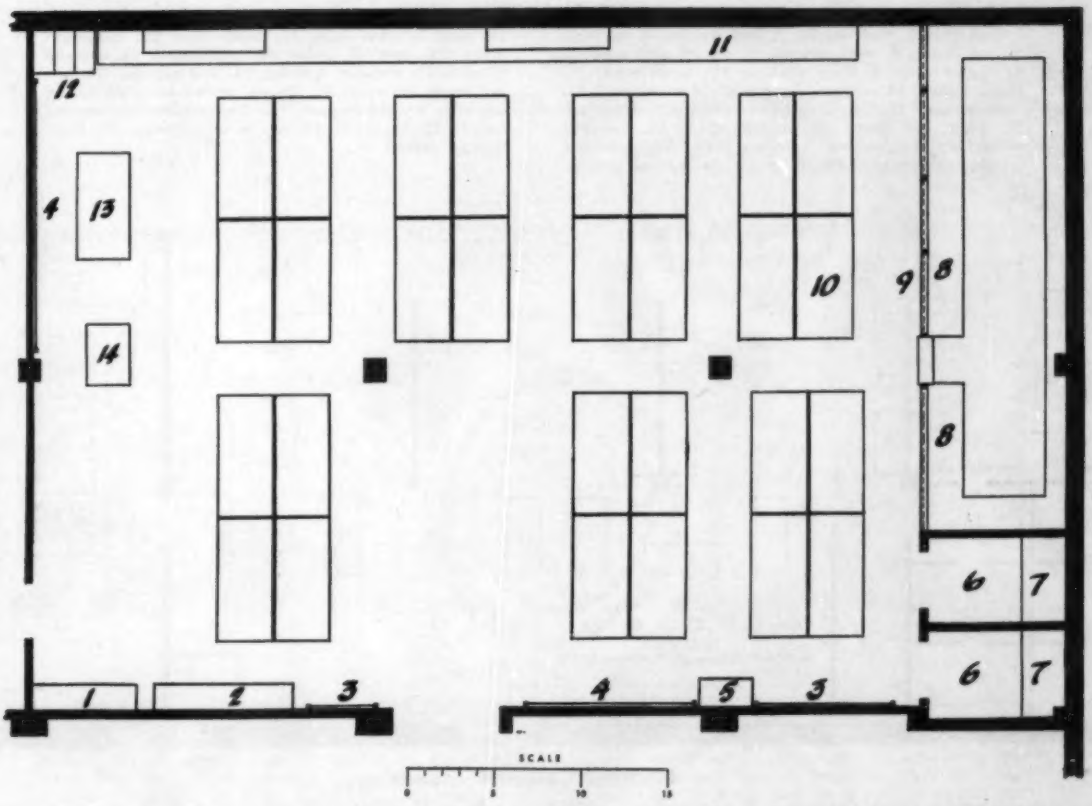
One must also understand that in the *Cleveland plan* of apprentice training the time in school is divided equally between related technology and related shop. A study of the layouts will show provisions for both phases of training and that the general plan is to have the related classrooms for a particular trade adjacent to the shop with the dividing wall, a movable steel partition with clear glass windows and doors. This provides easy teacher control in small enrollment trades where apprentices may be occupying both shop and related room at the same time and under the direction of one teacher.

Vocational high school day trade programs may be at the option of the student for immediate preparation for employment or for preparation for employment and a vocational high school diploma. In the transportation division the laboratory plan is followed which accounts for nine separate laboratories and shops including an elementary hand tool, auto engine, auto chassis, auto electricity, and auto machine laboratories plus a diesel, heavy duty truck, auto repair, auto tune up, and auto body and fender shops. From this it is evident that actual work on customer cars is done only after the student has spent three semesters in preparation. In all trade areas upon completion of the full-time program, students are generally placed as apprentices and continue to



Diesel Shop

1. Drill press; 2. work area; 3. grinder; 4. arbor press; 5. valve refacer; 6. lathe; 7. filing cabinet; 8. chart easel; 9. demonstration bench; 10. engine mount; 11. wash sink; 12. portable cart; 13. graded floor drain; 14. cabinets; 15. tool cabinets; 16. teacher's cabinet; 17. teacher's desk; 18. chalkboard; 19. test bench; 20. test stand; 21. steel bench and shelves; 22. storage; 23. monorail

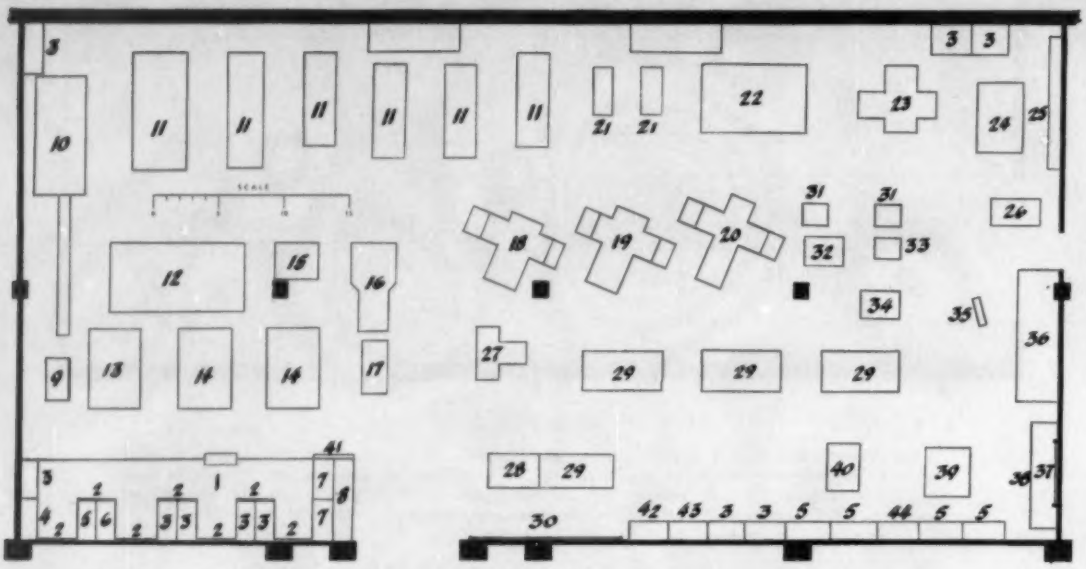


TV Repair Shop

1. Sink and fountain; 2. coat rack; 3. mounting board; 4. chalkboard; 5. teacher's wardrobe; 6. soundproof booths; 7. work area and shelves; 8. shelves and bins; 9. wire mesh screen; 10. workbenches; 11. storage; 12. vertical files; 13. demonstration table; 14. desk

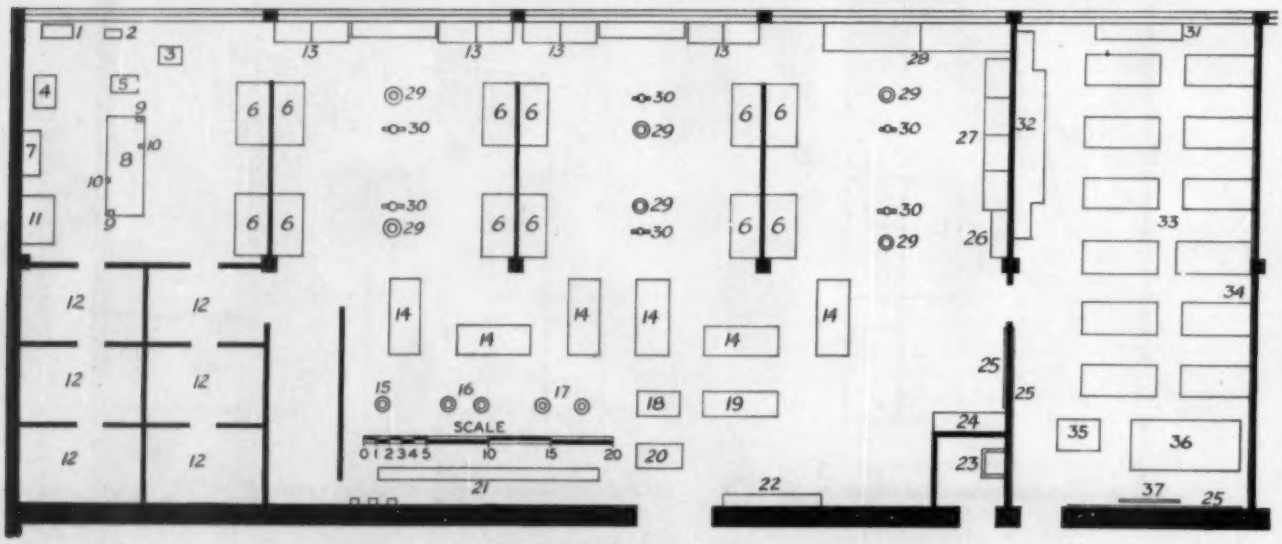
attend school as such until their apprenticeship is completed.

Probably the most outstanding and interesting part of the entire building project can be found in the planning of the shop areas; here is a fine example of teacher participation resulting in a building designed around the many and characteristic training areas to be served. No two shops are even remotely alike although the bays of 800 square feet are basic in the three story shop



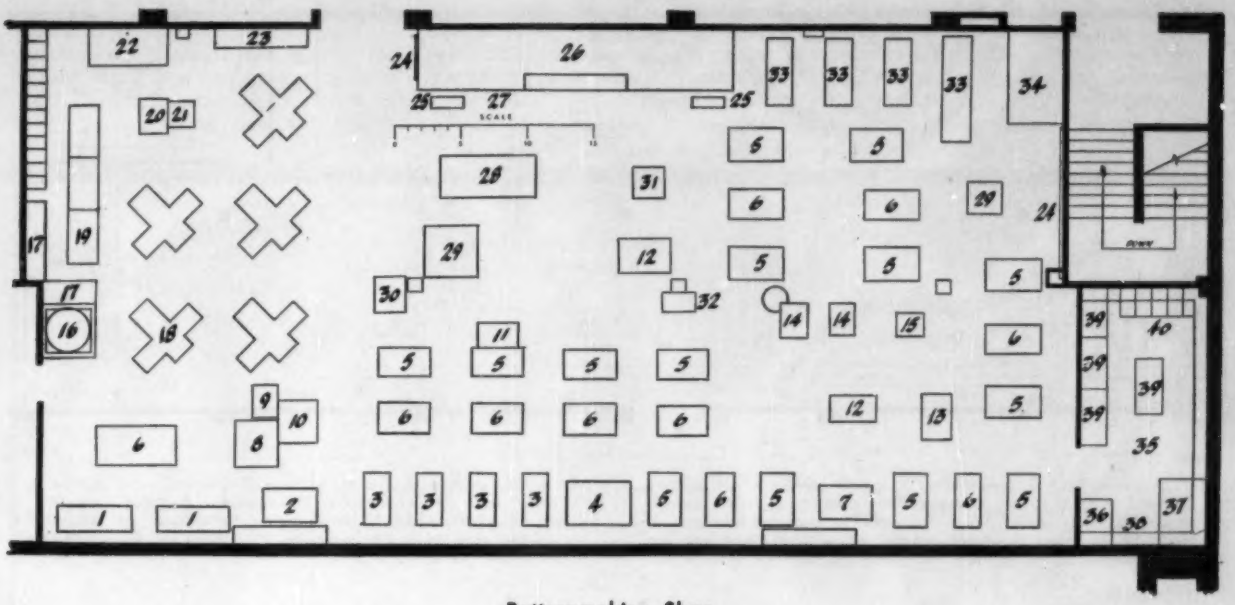
Advanced Machine Shop

1. Tool crib; 2. tool boards; 3. tool storage; 4. castings; 5. tool boxes; 6. work storage; 7. special tool cabinets; 8. display case; 9. filing machine; 10. turret lathe; 11. 16-in. lathes; 12. shaper-planer; 13. 16-in. shaper; 14. 14-in. shaper; 15. 2-h.p. drill press; 16. radial drill press; 17. 1-h.p. drill press; 18. vertical miller; 19. universal miller; 20. plain miller; 21. arbor press; 22. cylindrical grinder; 23. tool and cutter grinder; 24. surface grinder; 25. coat and hat rack; 26. power saw; 27. bridgeport miller; 28. desk; 29. bench; 30. chalkboard; 31. pedestal grinder; 32. carboloy grinder; 33. drill grinder; 34. layout bench; 35. anvil; 36. furnace and oil bath; 37. mirror; 38. sink; 39. punch press; 40. DoAll saw; 41. mounting board; 42. bookcase; 43. teacher's wardrobe; 44. DoAll storage cabinet



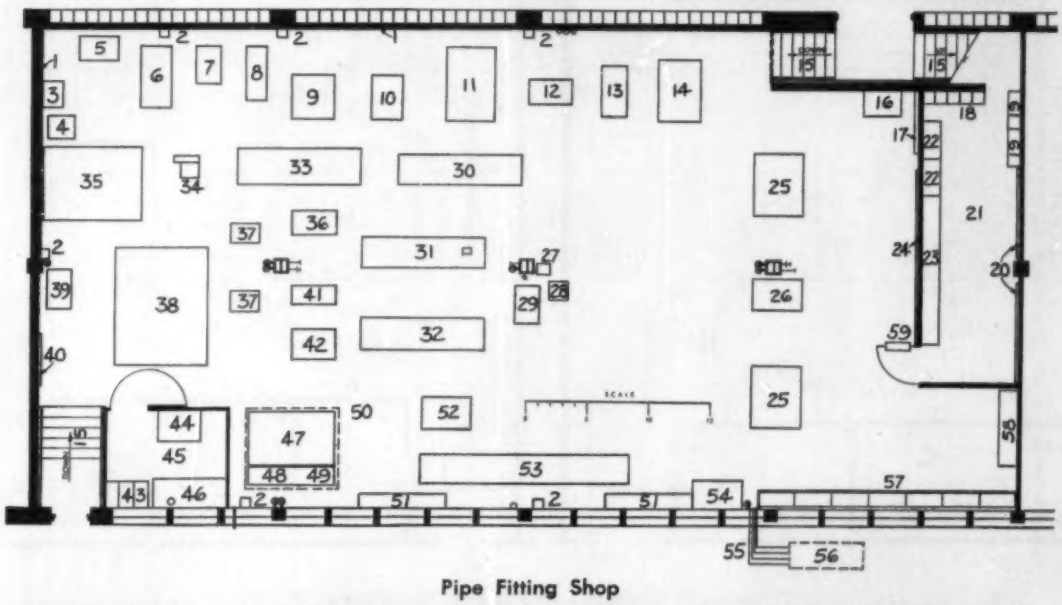
Electrical Construction Shop

1. Welding bench; 2. portable generator; 3. hack saw; 4. welder; 5. pipe machine; 6. shop bench; 7. lockers; 8. pipe bench; 9. pipe vise; 10. machine vise; 11. pipe rack; 12. wiring frame; 13. tool-case; 14. layout tables; 15. inverter; 16. P. B. control motor; 17. manual control motor; 18. desk; 19. demonstration table; 20. filing cabinet; 21. switchboard; 22. pipe shelf; 23. slop sink; 24. wash sink; 25. chalkboard; 26. storage; 27. cabinets; 28. test benches; 29. rotor; 30. generator; 31. storage; 32. cabinets; 33. tables; 34. mounting board; 35. teacher's desk; 36. demonstration table; 37. visual aid screen



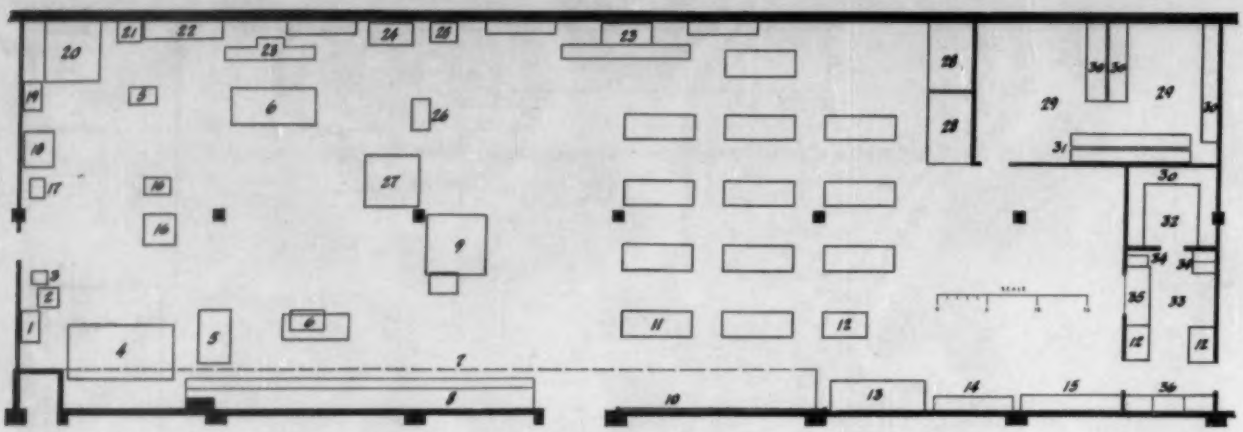
Patternmaking Shop

1. 13-in. Metal lathe; 2. soldering bench; 3. metal pattern bench; 4. shellac bench; 5. pattern bench; 6. layout table; 7. surface plate; 8. metal grinder; 9. pedestal grinder; 10. DoAll saw; 11. 8-in. jointer; 12. band saw; 13. router; 14. disk grinder; 15. spindle sander; 16. cupola and stack; 17. coat and hat rack; 18. milling machines; 19. metal benches; 20. metal band saw; 21. metal disk sander; 22. plaster bench; 23. sink; 24. mounting board; 25 emery wheel; 26. toolroom; 27. wire mesh screen; 28. jointer; 29. circular saw; 30. drill press; 31. planer; 32. glue pot; 33. wood lathes; 34. lumber rack; 35. office; 36. desk; 37. blueprint cabinet; 38. shelf; 39. table; 40. vertical files



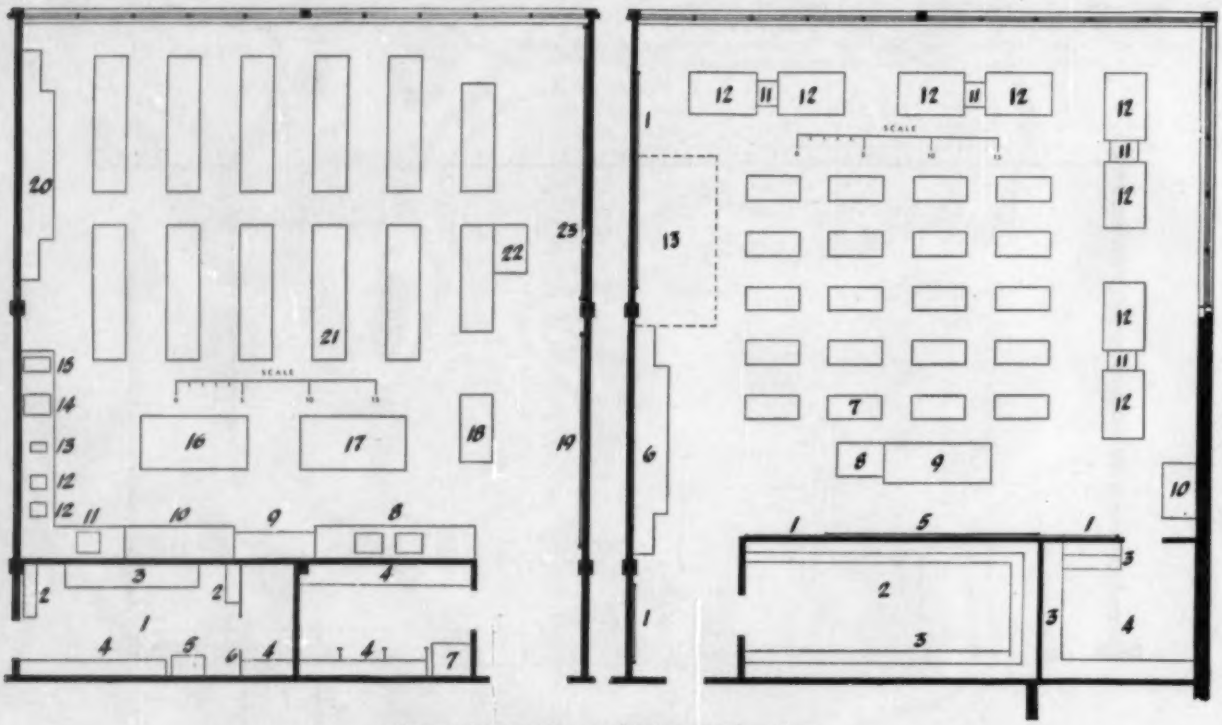
Pipe Fitting Shop

1. Angle iron rails for installation of future equipment; 2. floor drains; 3. air compressor; 4. thermobank; 5. compressor; 6. ice cream cabinet; 7. ice cuber; 8. ice cream cabinet; 9. hot water boiler; 10. hot water boiler; 11. crane No. 20; 12. vacuum heat pump; 13. American standard boiler; 14. oil boiler; 15. staircase; 16. teacher's wardrobe; 17. hydrostatic mock-up panel; 18. storage bins; 19. bins with sliding doors; 20. tool panel; 21. storeroom; 22. tool cabinets; 23. steel shelving; 24. chalkboard; 25. tripod pipe vise; 26. power vise; 27. pedestal grinder; 28. weld table; 29. arc welder; 30. workbench; 31. workbench with drill press; 32. steel workbench; 33. hydraulic pump mock-up; 34. rapid charger; 35. walk-in cooler; 36. regrigerator test; 37. household refrigerator; 38. radiant heat model; 39. refrigerator compressor; 40. mounting board; 41. gas household refrigerator; 42. gas refrigerator pressure; 43. vertical files; 44. desk; 45. office; 46. table; 47. work area sprinkler lead caulking; 48. 13,000 BTU gas burner bench; 49. test bench manual hydrostatic; 50. ventilator hood; 51. unit vent; 52. refrigerator demonstration; 53. automatic sprinkler control valves; 54. air temperature conditioner; 55. double oil lines; 56. oil storage; 57. pipe rack; 58. sink and drinking fountain; 59. Dutch door



Carpenter Mill Shop

1. Shaper cabinet; 2. disk sander; 3. spindle sander; 4. belt sander; 5. band saw; 6. jointer; 7. mezzanine; 8. supply and tool cabinet; 9. straight line ripsaw; 10. chalkboard; 11. carpenter benches; 12. desk; 13. carpenter hand-tool cabinet; 14. sink; 15. coat and hat rack; 16. shaper; 17. grinder; 18. boring machine; 19. tenoner tool cabinet; 20. single end tenoner; 21. saw gummer; 22. saw cabinet; 23. radial saw; 24. wood lathe; 25. mortiser; 26. table saw; 27. planer; 28. lumber racks; 29. linoleum and tile storage; 30. shelves; 31. double pipe rack; 32. toolroom; 33. office; 34. file cabinet; 35. worktable; 36. cabinets



Material Inspection and Science Laboratory

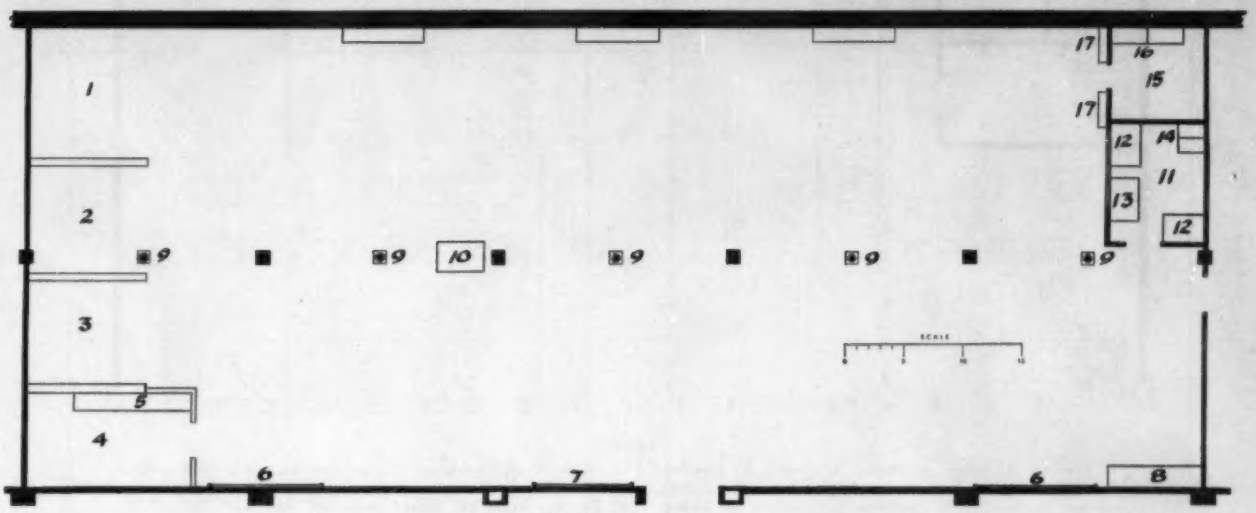
1. Storage room; 2. small part bin; 3. steel bin; 4. shelving; 5. Dorabitt; 6. wire mesh screen; 7. safe; 8. surface plates; 9. sink; 10. workbench; 11. electric furnace; 12. electrolimit gauges; 13. microscope; 14. Brinell; 15. Rockwell; 16. Olsen testing bench; 17. metallographic polishing equipment; 18. bench centers; 19. mounting board; 20. storage; 21. inspection benches; 22. desk; 23. chalkboard and visual aid screen

Science Laboratory and Material Inspection (at right)

1. Mounting board; 2. storage; 3. shelf and counter units; 4. chemical storage; 5. chalkboard; 6. storage and display case; 7. 20 science tables; 8. desk; 9. science desk; 10. fume hood. 11. sink; 12. science tables; 13. mock-ups, cutaways, models, etc.

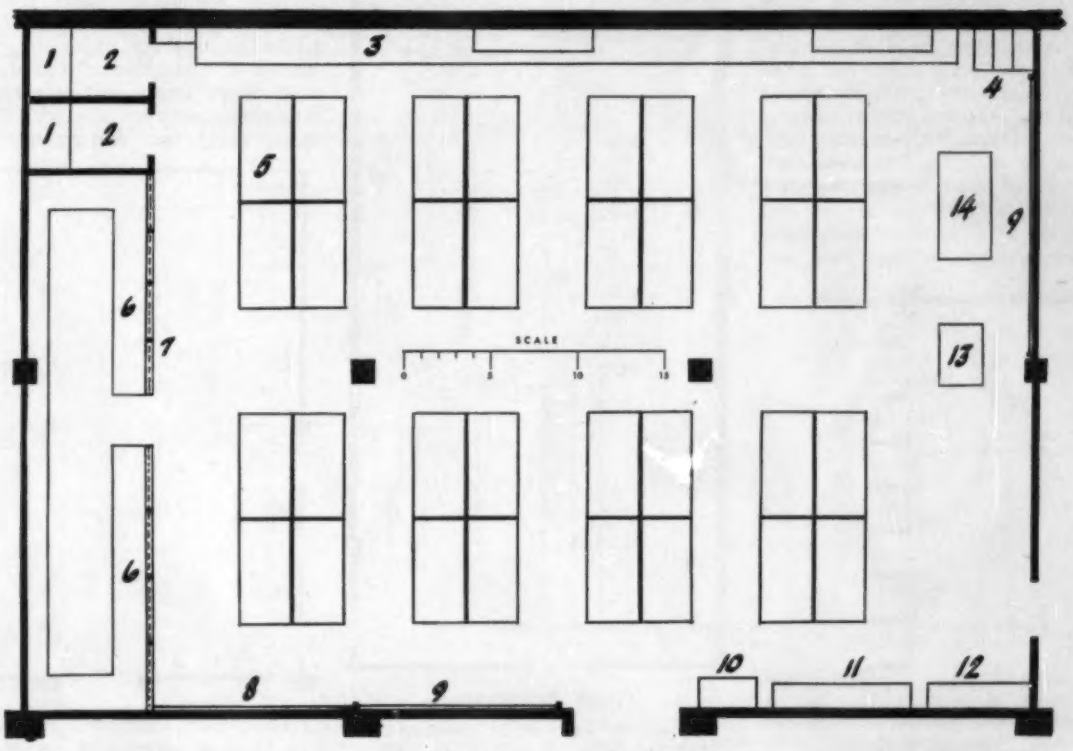
building with the number of bays assigned to a shop being determined by the number of square feet needed for the activity. These shop areas vary from 1600 to 4800 square feet. Credit is given to the school board architects and engineers who worked from teacher drawings of shop equipment and storage needs and who only in rare cases of engineering or structural conflicts found it necessary to alter the plans as developed by teachers and trade advisory groups. Needless to say the major part of teacher planning was done many months before the architects took over and started to develop the final plans.

Strict standardization of shops was in general not possible although it was



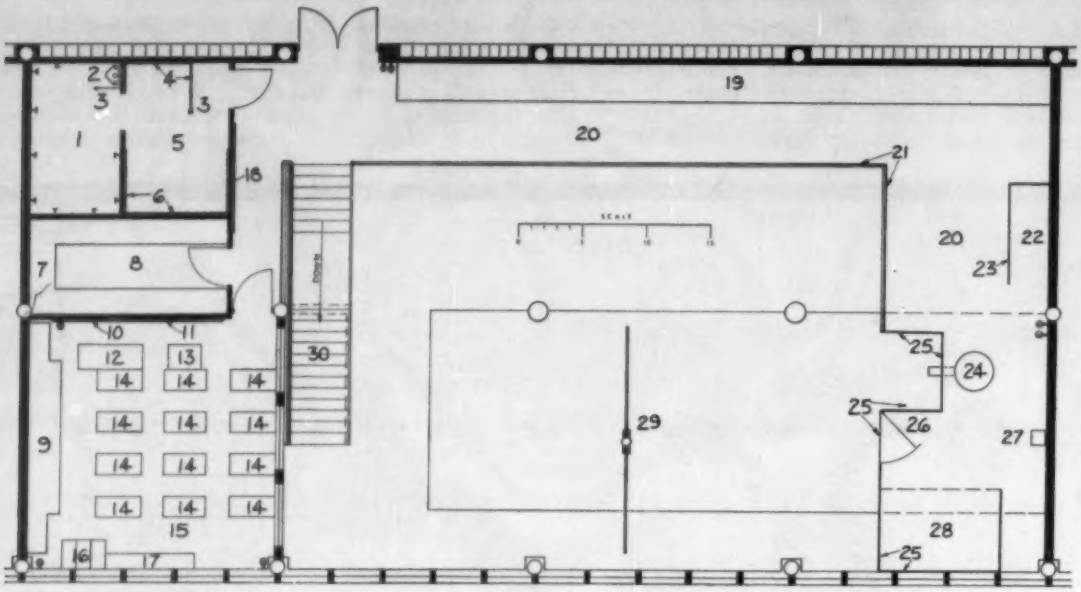
Bricklaying Shop

1. Kitchen area; 2. bathroom area; 3. bricklaying area; 4. tool storage room; 5. shelving; 6. chalkboard; 7. mounting board; 8. sink; 9. floor drain; 10. masonry saw; 11. office; 12. teacher's desk; 13. table; 14. filing cabinet; 15. tool storage; 16. tool cabinets; 17. coat rack



Radio Repair Shop

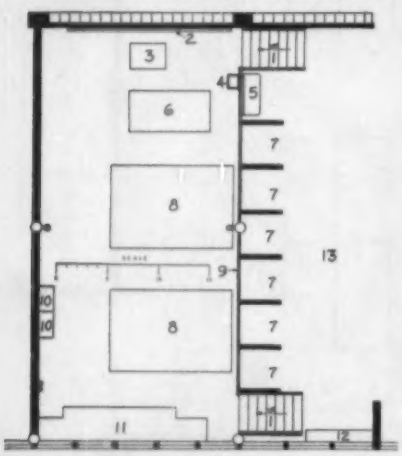
1. Shelving and work area; 2. soundproof booths; 3. shelf; 4. vertical files; 5. workbenches; 6. shelves and bins; 7. wire mesh screen; 8. mounting board; 9. chalkboard; 10. teacher's wardrobe; 11. coat rack; 12. sink; 13. desk; 14. demonstration table



Foundry

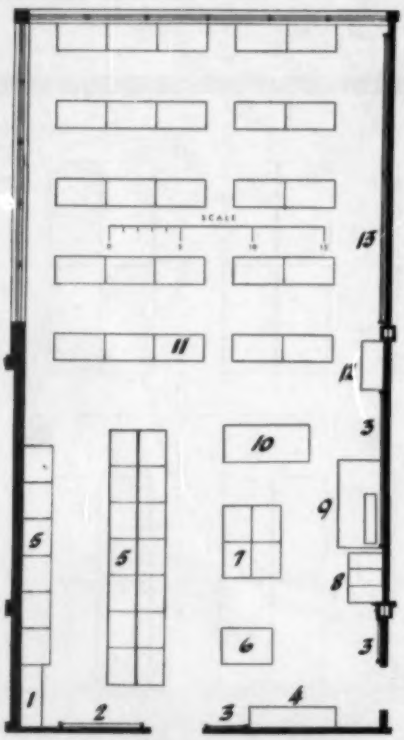
1. Shower; 2. toilet; 3. baffle; 4. towel; 5. dressing; 6. clothing hooks and benches; 7. shelving; 8. pattern storage; 9. storage; 10. chalkboard; 11. visual aid screen; 12. demonstration table; 13. desk; 14. tables; 15. related room; 16. filing cabinet; 17. uni-vent; 18. mounting board; 19. shelving; 20. balcony; 21. pipe rail; 22. coke storage; 23. iron wall; 24. cupola stock; 25. iron wall; 26. solid gate; 27. scale; 28. scrap storage; 29. traveling crane

possible and advisable to follow the same pattern in all related rooms, drafting, and the so-called academic classrooms. In the twenty related rooms all have a seating capacity of 24, are provided with darkening shades for visual aid instruction, are provided with a standard bank of steel storage cabinets, horizontal or vertical blueprinting cabinets, teacher desks, and in some cases demonstration benches with necessary utilities. All window sills in the shop building are 58 in. from the floor, lights are flourescent and in shops with considerable machinery overhead bus ducts provide the source of power to individual machines. Master emergency "knockout" switches are strategically located in all shops which are predominantly of a machine or hazardous nature. Shops involving fumes and saw dust are properly equipped with the necessary ducts, fans, and exhaust equip-



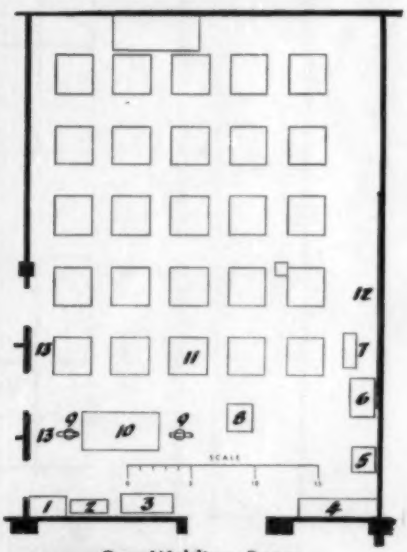
Sign Painter's Shop

1. Staircase; 2. chalkboard; 3. desk; 4. slop sink; 5. sink; 6. metal top table; 7. plastering or dry wall booths; 8. sign painter's table; 9. pipe rail; 10. cabinets; 11. room cabinet; 12. unit vent; 13. plastering room



Watch Repair Shop

1. Coat and hat rack; 2. chalkboard; 3. mounting board; 4. sink; 5. 20 jewelry benches; 6. desk; 7. 4 engravers' benches; 8. vertical files; 9. bench lathe and drill press; 10. watch cleaning machine and timer bench; 11. 25 watch repair benches; 12. teacher's wardrobe; 13. chalkboard with visual screen

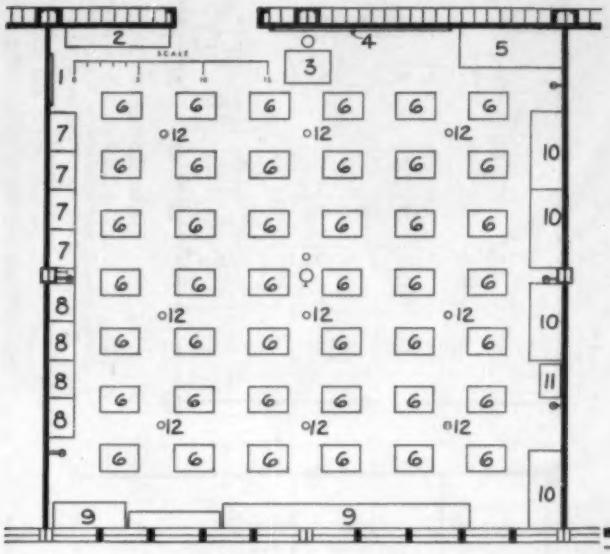


Gas Welding Room

1. Teacher's wardrobe; 2. annealing; 3. cooling tank; 4. sink; 5. grinder; 6. scrap truck; 7. slicing shear; 8. teacher's desk — high type; 9. anvil; 10. workbench; 11. welding tables with floor outlets for oxygen, hydrogen, and acetylene; 12. chalkboard; 13. mounting board

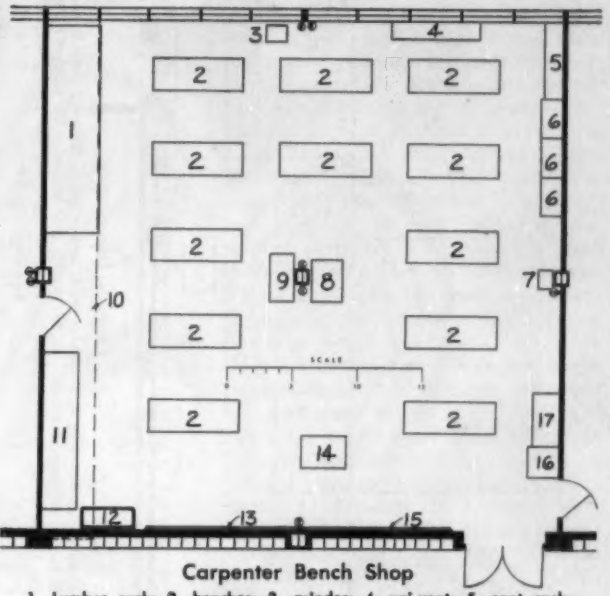
ment to adequately and safely eliminate these elements. All shops are liberally provided with electric convenience outlets, air, water, and welding gas outlets as needed.

Tool rooms are used in only a few areas with most shops caring for tools in specially designed steel cupboards, with heavy wire mesh sliding fronts. These were designed and fabricated by the school and provide safe storage with easy checking of the tools which are outlined and mounted on plywood tool boards. The number assigned to each shop area depends upon the area's tool requirements. Shops used by high school students also have large heavy duty lockers which are assigned to individ-



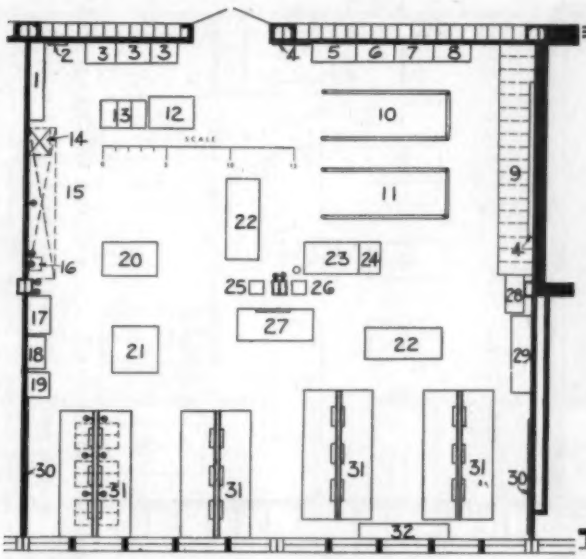
Engine Laboratory

1. Mounting board; 2. sink; 3. desk; 4. chalkboard; 5. display and test board; 6. frames; 7. storage standard tools; 8. tote box storage; 9. lockers; 10. workbench; 11. teacher's wardrobe; 12. floor exhausts



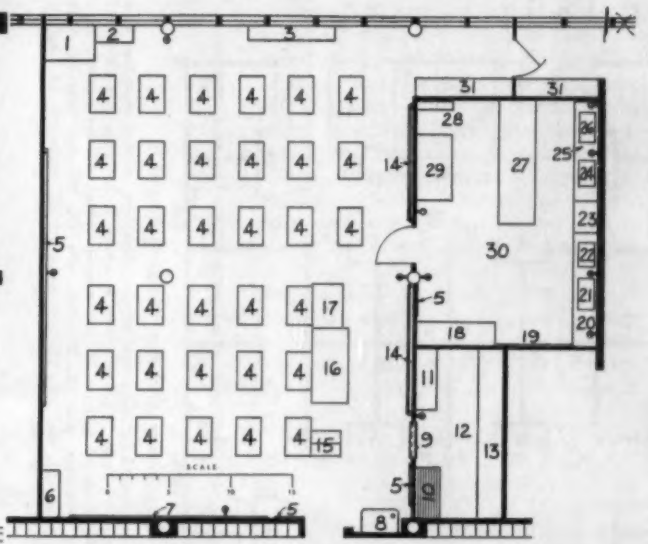
Carpenter Bench Shop

1. Lumber rack; 2. benches; 3. grinder; 4. uni-vent; 5. coat rack; 6. storage; 7. grinder; 8. rip saw; 9. jointer; 10. balcony; 11. tool cabinet; 12. sink; 13. chalkboard; 14. teacher's desk; 15. mounting board; 16. filing cabinet; 17. teacher's cabinet



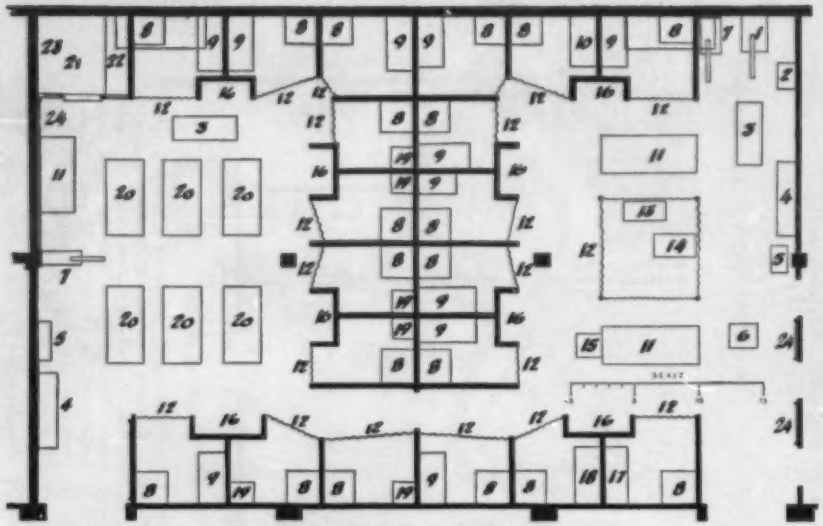
Auto Electric Shop

1. Sink; 2. power punch; 3. cabinets; 4. mounting board; 5. teacher's wardrobe; 6. tool cabinet; 7. tool cabinet; 8. tool cabinet; 9. benches with lockers; 10. car wiring station; 11. car wiring station; 12. desk; 13. vertical file; 14. battery service area; 15. hood; 16. charger; 17. parts cleaner; 18. distributor tester; 19. distributor tester; 20. starter test bench; 21. test stand; 22. workbench; 23. engine stand; 24. engine analyzer; 25. pedestal grinder; 26. pedestal grinder; 27. workbench with test panel; 28. cabinet; 29. coat and hat rack; 30. chalkboard; 31. electric worktables; 32. unit vent



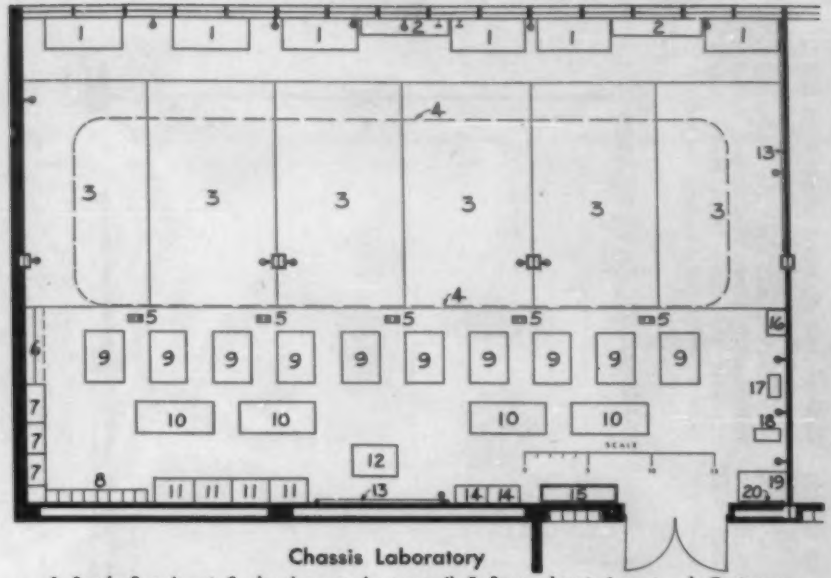
Drafting Room

1. Drawing file; 2. steel shelving; 3. unit vent; 4. drawing tables; 5. mounting board; 6. teacher's wardrobe; 7. chalkboard; 8. sink; 9. Dutch door; 10. chart rack; 11. shelving; 12. storeroom; 13. shelving for books, boards, paper, drawing objects, etc.; 14. visual screen, chalkboard, and mounting board; 15. vertical file; 16. table; 17. desk; 18. worktable; 19. chalkboard; 20. built-in workbench; 21. dryer; 22. fixer; 23. sink; 24. developer; 25. light proof shelf; 26. photo copy; 27. cutting table; 28. ventilator; 29. blueprint developer and printer; 30. blueprint room; 31. coat and hat rack



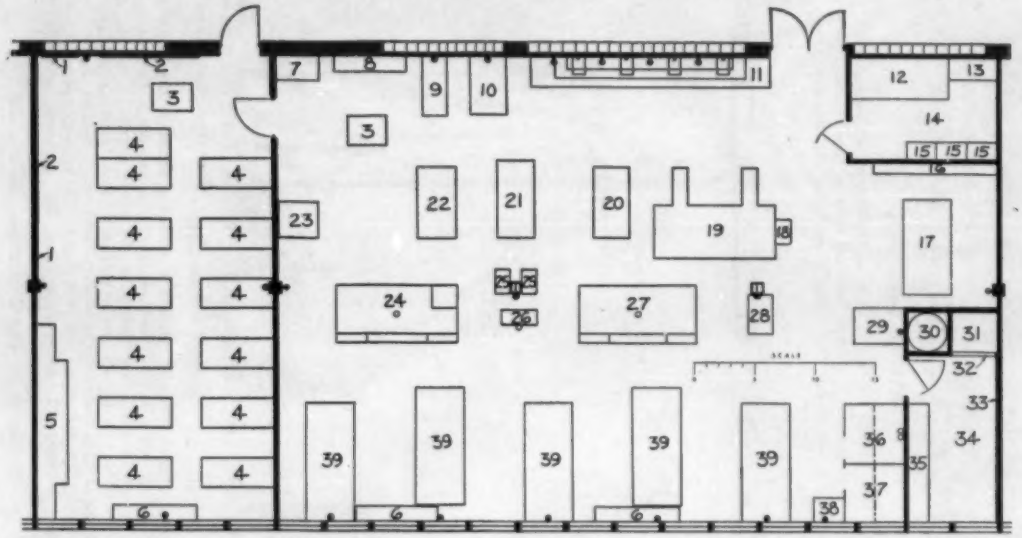
Apprentice and Arc Welding Rooms

1. Splitting shear; 2. grinder; 3. straightedge oxygen, acetylene, cutting machine; 4. sink; 5. cooling tank; 6. foreman's desk; 7. cut-off shear; 8. bench; 9. 200-amp. arc; 10. 800-amp. arc; 11. workbench; 12. fireproof curtain; 13. gas engine welder; 14. arc welder; 15. drill press; 16. storage; 17. 400-amp. arc; 18. 300-amp. arc; 19. 150-amp. arc; 20. oxygen, hydrogen, acetylene benches; 21. tool crib; 22. tool cupboard; 23. toolboard; 24. chalkboard



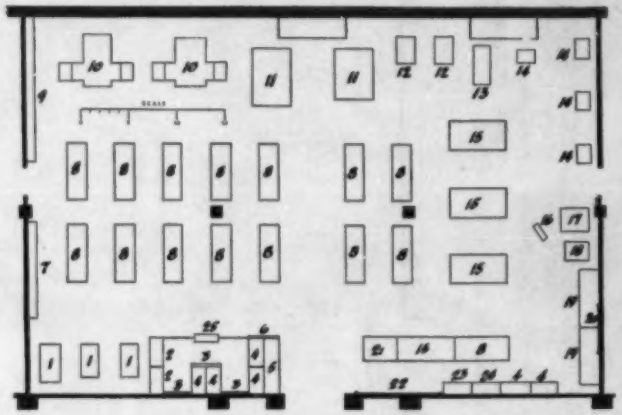
Chassis Laboratory

1. Bench; 2. uni-vent; 3. chassis area; 4. mono-rail; 5. floor exhaust; 6. coat rack; 7. storage; 8. lockers; 9. engine stands; 10. bench; 11. tool cabinets; 12. teacher's desk; 13. chalkboard; 14. storage; 15. sink; 16. cleaning tank; 17. grinder; 18. drill press; 19. engine overhaul; 20. mounting board



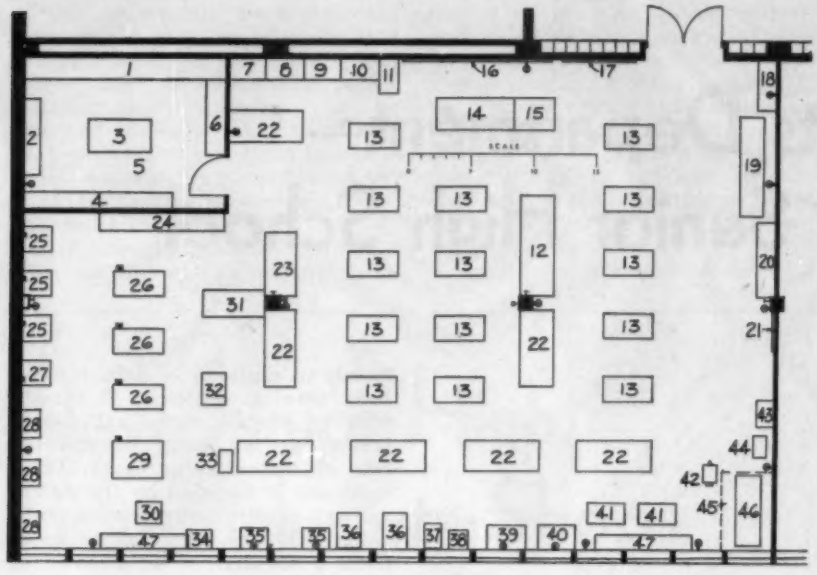
Sheet-Metal Shop

1. Mounting board; 2. chalkboard; 3. desk; 4. table; 5. cupboard assembly; 6. univents; 7. teacher's wardrobe; 8. sink; 9. Hi-Speed; 10. welder; 11. built-in workbench with ventilating hood; 12. sheet stock; 13. angle, band and rod stock; 14. storage and supplies; 15. storage; 16. coat and hat rack; 17. brake; 18. motor for power shear; 19. power shear; 20–22. brake; 23. shear; 24. bench; 25. grinders; 26. lock former; 27. bench; 28. drill press; 29. DoAll saw; 30. cupola stack; 31. cupboard; 32. slide-up door; 33. tool panel; 34. toolroom; 35. shelving; 36. arc welding; 37. arc welding; 38. arc welder; 39. workbench



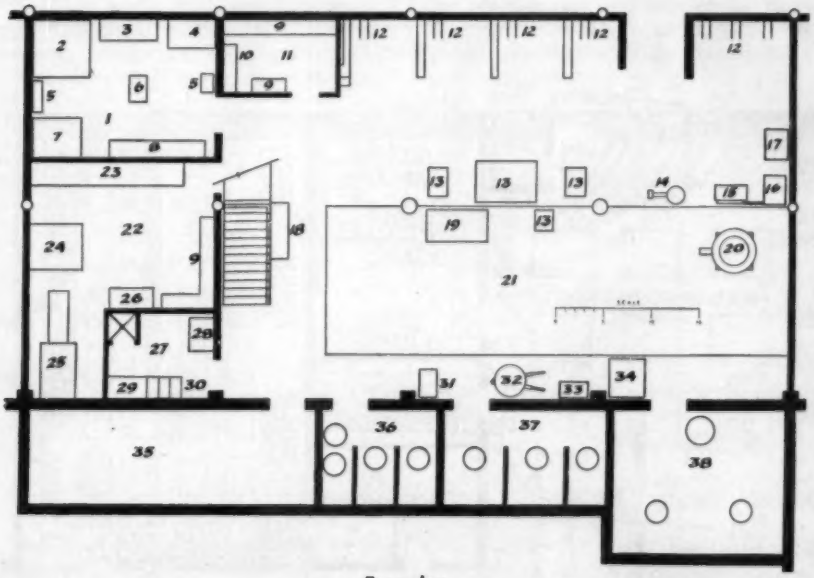
General Machine Shop

1. Drill press; 2. toolbox storage; 3. tool board; 4. tool cabinets; 5. display case; 6. mounting board; 7. coat and hat rack; 8. 13-in. lathe; 9. power panel; 10. milling machine; 11. 14-in. shaper; 12. arbor press; 13. power saw; 14. pedestal grinder; 15. workbench; 16. anvil; 17. gas furnace; 18. oil and water tank; 19. sink; 20. mirror; 21. desk; 22. chalkboard; 23. bookcase; 24. teacher's wardrobe



Auto-Machine Shop

1. Shelving; 2. steel storage; 3. preparation bench; 4. shelving; 5. storeroom; 6. storage; 7, 8. tool cabinets; 9. teacher's cabinet; 10. storage; 11. letter file; 12. bench; 13. engine stand; 14. demonstration bench; 15. teacher's desk; 16. chalkboard; 17. mounting board; 18. display; 19. engine stand; 20. sink; 21. power panel; 22. bench; 23. bench; 24. coat rack; 25. drill press; 26. lathe; 27, 28. grinders; 29. lathe; 30. brake reliner; 31. power saw; 32. portable cleaning tank; 33. arbor press; 34. buffer; 35. brake drum lathe; 36. speed lathe; 37. reamer; 38. grinder; 39, 40, 41. valve refacer; 42. anvil; 43. slop sink; 44. tong rack; 45. vented hood; 46. gas furnace; 47. uni-vent



Foundry

1. Cleaning room; 2. dust arrester; 3. roto-blast; 4. sand blast; 5. grinder; 6. metal saw; 7. sand blast mill; 8. filing, inspection and assembly; 9. steel shelving; 10. supply cabinets; 11. toolroom; 12. molding rooms; 13. molding machines; 14. brass furnace; 15. melting furnace; 16. transformer; 17. aluminum furnace; 18. sink; 19. pattern drawing machine; 20. cupola; 21. sand floor; 22. core room; 23. core-making bench; 24. core-blowing machine; 25. core oven; 26. pasting and finishing bench; 27. office; 28. desk; 29. teacher's cabinet; 30. filing cabinet; 31. sand conditioner; 32. mull barrow; 33. sand muller; 34. whirlmix sand miller; 35. flask and lumber storage; 36. sand and clay; 37. sand storage; 38. coke storage

uals. Those shops having tool rooms vary the sizes to suit the needs, using tool boards and/or storage cupboards depending upon the nature of the tools to be used.

All educational supplies are received, inventoried, and stored in a *central storage* area to be requisitioned as needed by the department ordering. This area includes over 5000 square feet of space and is equipped with levelator and overhead monorail for loading and unloading, pits for sand are so located that delivery trucks can back into the area for unloading. All gases used in welding are stored and manifolded in a special vault, the floor of which is at truck bed level for ease of unloading and loading of tanks. The gases are piped to shops where they are used. For distribution of supplies and equipment throughout the school a 6000 pound capacity freight elevator is accessible from the storage area; this will easily accommodate a small truck, passenger car, and stock up to 22 ft. long, and serves the below grade areas as well as the three floors of the shop building.

Costs were as follows: Site $358,000 (about 1.5 acres of the 5.5 acres were already owned), general contract including heating, plumbing, and electrical $2,465,000, new equipment $570,000, and the replacement value of old equipment estimated at $500,000. On the building alone the cubic foot cost was 83.7 cents.

In addition to the 34 shops and laboratories, 20 related classrooms, 11 academic classrooms, and the science and materials laboratories the building includes the following: dispensary, public-address room with 90 broadcasting outlets, photo darkroom, textbook storage, high school office, apprentice and adult education office, pupil lunchroom, teacher lunchroom, combination gymnasium and auditorium, library, and a special industrial demonstration and visual aid room seating 150 persons. 90 intercommunication telephones and 29 extensions to the outside trunk lines help to solve an important problem in a school of this type. Parking on the site for 300 cars while adequate now will no doubt be taxed in years to come.

While not a *plush* building it is a fine example of a flexible and functional structure with maintenance and upkeep, due to the liberal use of glazed tile being reduced to a minimum. After four months of use all agree that while not perfect the months of planning by teachers and their respective trade advisory groups has paid off and as one Ohio educator stated, "this structure is proof that school architects can well afford to listen to and incorporate the ideas of the persons who in the last analysis are to work in the areas."

Industrial Arts Department— Mt. Pleasant Senior High School

HERBERT L. NELSON
and
LORNIE G. KERR
Mt. Pleasant, Mich.

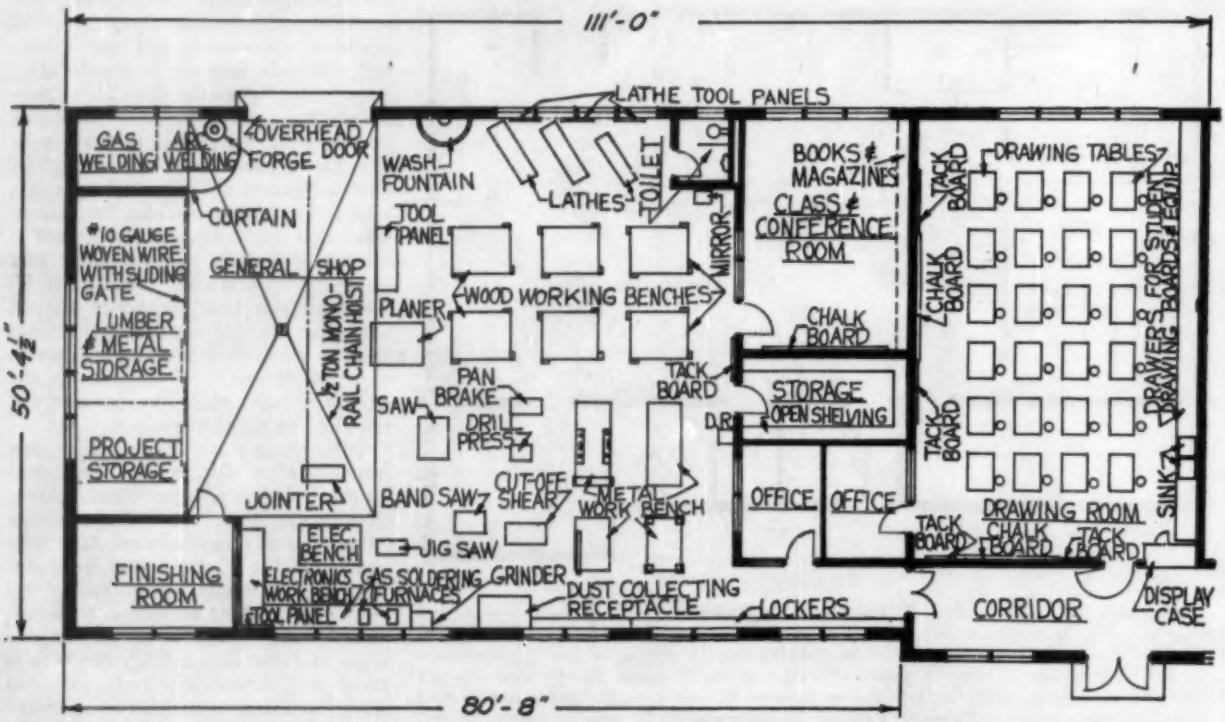
The Mt. Pleasant Senior High School has just completed a year and a half of operation in its new building. At present it has a student population of approximately 700. Of this number about 275 students, boys and girls from the tenth, eleventh, and twelfth grades are enrolled in industrial-arts classes.

The industrial department is composed of a drafting room and a comprehensive general shop, each having several unique features.

The drafting room has a system of diagonal lighting recommended for drawing and blueprint reading classes. Each student has his own lock drawer for storage which he can transfer to the individual desks. The room can accommodate six classes of 24 students daily. Basic drawing equipment, T squares, triangles, irregular curves, and dusting brushes are suspended along the left side of each drawing bench. Other equipment is furnished by the student and kept in individually locked drawers.

The following courses are being offered in the drafting department this year: blueprint reading, general drafting, aircraft drafting, architectural drafting, and machine drafting.

The over-all size of our general shop is 50 ft. wide by 80 ft. long. We are equipped to accommodate 24 students in each class and at present we are operating at near capacity. We operate our school on a seven-period day. The shop is in use each period throughout the day.



Floor plan of the shops and classrooms in the Industrial Arts Department at Mt. Pleasant Senior High School

Although we have a comprehensive type general shop, we offer unit type classes as well. Our program of courses offered this year includes: carpentry, cabinetmaking and design, electronics and basic mechanics. The areas of work in basic mechanics include: basic machine woodworking, metalworking and welding. Fiberglas, household electricity, and motor mechanics.

Our permanent facilities include: a classroom with ample chalkboard space, instructor's office with glass windows overlooking the shop, an exhaust and dust collection system, a finishing room, a project storage room, a lumber and metal storage room, a materials storage room, and toilet facilities. There are 144 individual lockers provided for the student. Seventy-two of these are the stand-up-type for the advanced classes and seventy-two are under the woodworking benches.

For tool storage we make use of 4 by 6 ft. portable A-frame tool panels.

The community also makes good use of our drawing and shop facilities through our adult education program. We have evening courses in drafting, upholstery, woodworking, and household mechanics.

Also included in our school program but in a different building is a machine shop. Here a three-hour class and a two-hour (experimental) vocational machine shop program is operating daily.

New Junior High Industrial Arts Shops

LYLE SOETEBER
and
WM. WOOD
Ind. Arts Dept.
Clark Jr. High School
E. St. Louis, Ill.

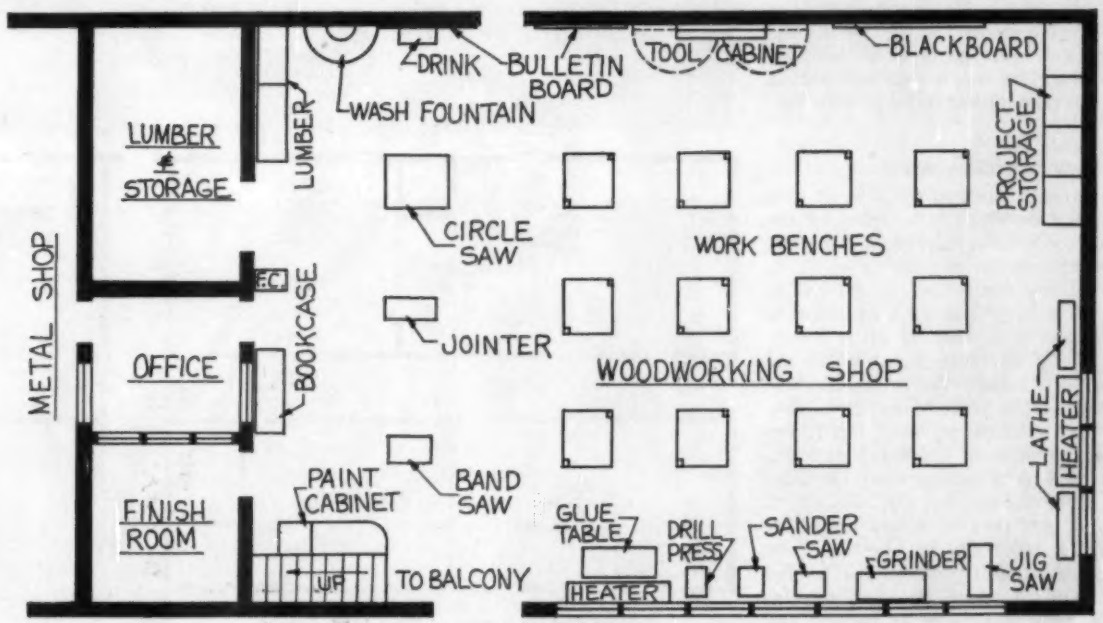
Clark Junior High was built in 1931 but like most other schools it became overcrowded about five years ago. Since the old shops were entirely too small for our purposes, and were on the main floor surrounded by classrooms it was imperative that they be moved to a new wing.

Location

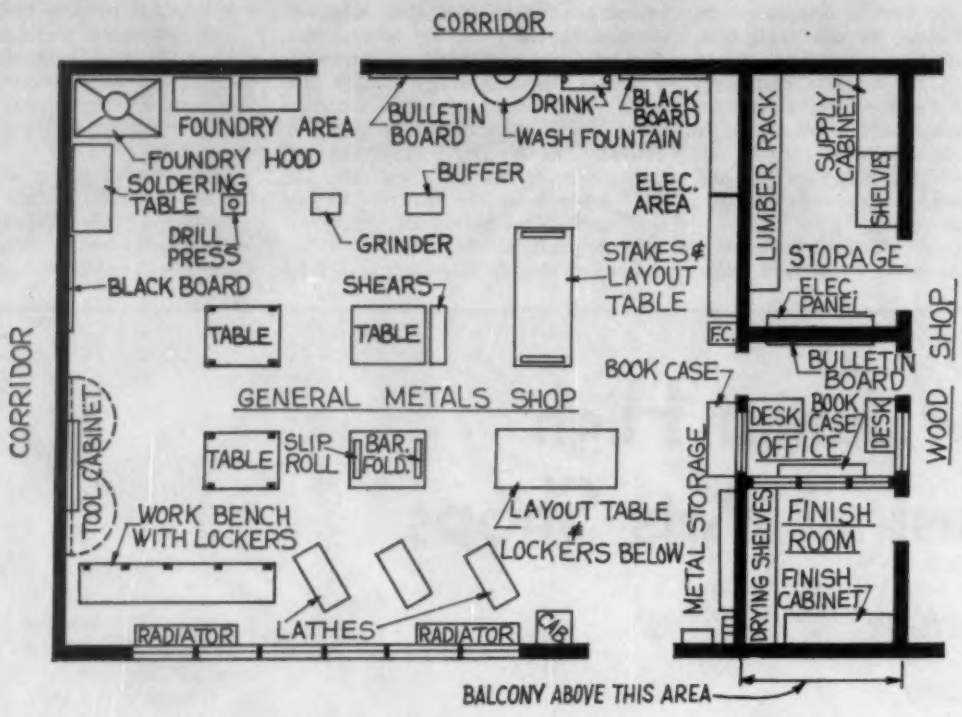
The present shops are located in the new addition with the band and chorus as neighbors. An alley runs along the west side for easy loading into either shop. There are two outside hall entrances and toilets in the new area.

Light, Heat, and Ventilation

The shops have an abundance of natural light and continuous strip fluorescent for artificial light. Heat is provided by automatic floor level univents. The ceiling type of univents were requested but were refused because of



Woodworking area at Clark Junior High School



General metals shop at Clark Junior High School, East St. Louis, Ill.

additional cost. This has resulted in some unusable space in both shops, particularly the metal shop. Each shop has a two speed 36-in. exhaust fan which can be used as needed. A small exhaust fan is located in the finish room.

Color

All walls are painted a light flat green which is very easy on the eyes. The darker eye rest green is used on all machines and lower parts of all benches, tables, etc. The bench tops and built-in cabinets are finished natural with varnish.

Auxiliary Areas

In between the two shops is an area ten feet wide which is occupied by the lumber room, office, and the finish room. Above this entire area of 10 by 38 ft. is a balcony which has proved invaluable. It is to a shop as a basement is to a home. It is used for extra lumber storage and all those things which are needed occasionally but are in the way the rest of the year. Many shop planners may criticize an office but it has proved valuable in a number of ways. It is used as a passageway; for talks with students, parents, and visitors. At least 90 per cent of either shop plus the finish room can be observed from the office. It also provides the teacher with a place where he can keep his books, records, etc., in an orderly and clean manner.

Program

The program that a boy takes in his three years may appear to be of the unit shop type but over a period of three years it becomes a general shop in nature. Since there are two teachers and an enrollment of nearly one thousand pupils it was felt that unit shops would fill the needs of the students better.

The industrial-arts program is as follows:

71 Woodcraft (1 period a day, 10 wks.)

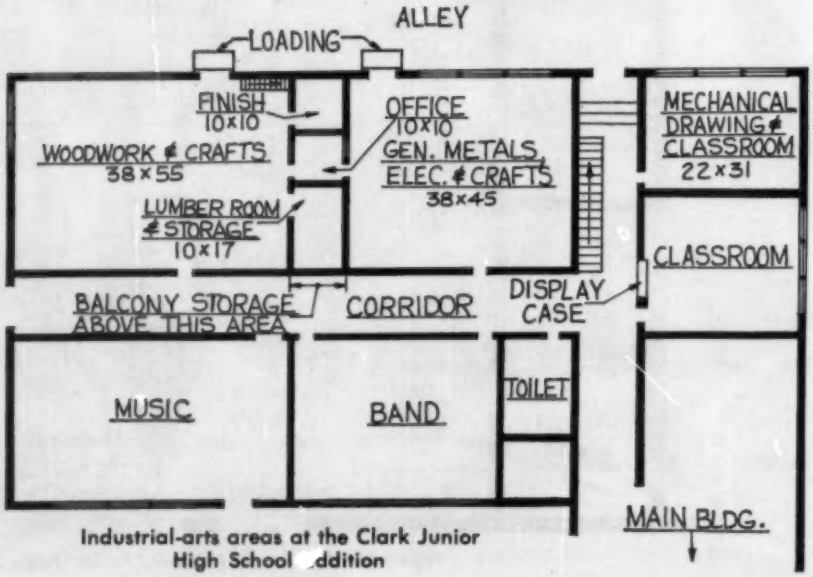
72 Metalcraft (1 period a day, 10 wks.)

81 Mechanical Drawing (1 period a day, 10 wks.)

82 Crafts, Leather, and Plastic (1 period a day, 10 wks.)

91 General Woodworking (1 period a day, 20 wks.)

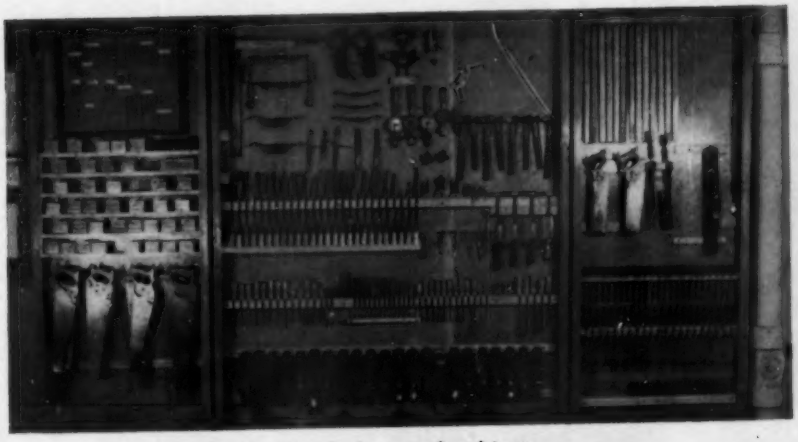
92 General Metals and Electricity (1 period a day, 20 wks.)



Industrial-arts areas at the Clark Junior High School addition

General metal-shop tool cabinet

Bookcase and planning area



Wood shop tool cabinet

There is probably only one distinguishing feature of this program that makes it different from many other schools. Most schools teach crafts first, whereas it is taught later here. It has been found that to teach crafts with any ease it is quite helpful if the students already know the routine of the shops, and have some basic knowledge of woods, metals, and drawing, plus the knowledge of how to use the simpler tools and machines that are in each shop. Most phases of crafts require materials and the use of tools and machines that are found in the drawing, wood, and metal areas. Therefore, crafts can very logically follow the other three areas.

HELPFUL AIDS FOR THE INDUSTRIAL ARTS TEACHER

ERNST H. SUERKEN
Supervising Principal
Union Free School District
Greenburgh No. 11
Dobbs Ferry, N. Y.

A little known source of helpful aids for industrial arts teachers especially those who wish to assume leadership in arts and crafts and recreational programs is the Publications Office of the Rural Research Institute, 500 Fifth Avenue, New York 36, N. Y. During the past six years the Institute has operated the Hampshire County Center in Westhampton, Mass., where the available booklets were developed out of the practical experience of the program itself.

The first booklet was *Furniture Refinishing* written by the Center's Director, Harold W. Watts, for the person who has had little or no experience in the art of refinishing furniture. It is the result of classes that the author conducted at the Center and is addressed to and written for the average person, not the expert.

A Project in Arts and Crafts is designed to meet the needs of volunteer leaders of arts, crafts, and recreational activities by furnishing ideas for programs and easy methods for carrying them out. It lends itself easily to adaptation by the industrial arts teacher. While some of the crafts in their more developed form involve intricate processes, the concern here is with simple methods, leaving the complex to later. The guiding principle is that skills are more quickly and firmly established when they do not overtax the individual's capacities. Satisfying accomplishment in all of these projects proved their suitability for school-age youth.

Woodworking For Beginners is a 32-

page instruction manual detailing a program of eleven woodworking projects, and one in cardboard, accompanied by drawings and appropriate general directions. The projects are presented in such an order as to develop increasing skills as the program progresses.

Metalcraft was the fourth booklet issued based on experimental classes conducted at the Institute's Hampshire County Center. The suggested metalcraft program consists of nine easy projects which can be carried out successfully. The costs involved are negligible, since waste or discarded materials to be found in almost every household are utilized. The tools required are limited to those tools which are usually kept in the average tool chest.

Ten Easy Woodworking Projects as its name implies describes articles that can be made by persons with little or no experience in woodworking. Mr. Watts experimented with three classes — one of thirty women, one of fourteen married couples, and the last class of doctors and other professional men all without previous experience or training before publishing the pamphlet. Among the articles produced in this program for beginners were spice boxes, match boxes, salt and nutmeg boxes, knife and fork boxes, and crickets or stools. Useful furniture such as tables, bookcases, cabinets, lamps, storm doors, and a number of cornices were made as a result of this program. Other articles included cabinets for tools, benches, bookcases, coffee tables, all of which were designed at the Center.

Principles of Modern Design for Country Living is designed to be a guide to preliminary thinking for prospective home builders in rural areas. It would lend itself easily as a teaching aid in carpentry and other vocational areas having to do with home construction.

Copies of any one of these booklets or of the entire series are available without charge from the Rural Research Institute, Inc., 500 Fifth Avenue, New York 36, N. Y. They are yours for the asking using either a postal card or a four-cent stamp.

New Hobart Brothers Technical School

W. H. HOBART, JR.
Troy, Ohio

On Monday, June 30, 1958, the Hobart Trade School moved into its brand new quarters in Westbrook. This was the first step in the evolution of the new Hobart Brothers Technical School, a nonprofit school devoted entirely to teaching, research, and development in the welding field.

Rapid progress was made in the construction of this new building by use of the latest welding and other building techniques. It covers approximately 80,000 square feet of floor space. There are 120 welding stations for training students in the use of all types of arc and gas welding equipment. Besides a number of classrooms, sizable demonstration areas, and a 400-seat auditorium with complete projection equipment, the new school will contain a technical library, laboratories, research and testing facilities, and an X-ray and radioisotope room.

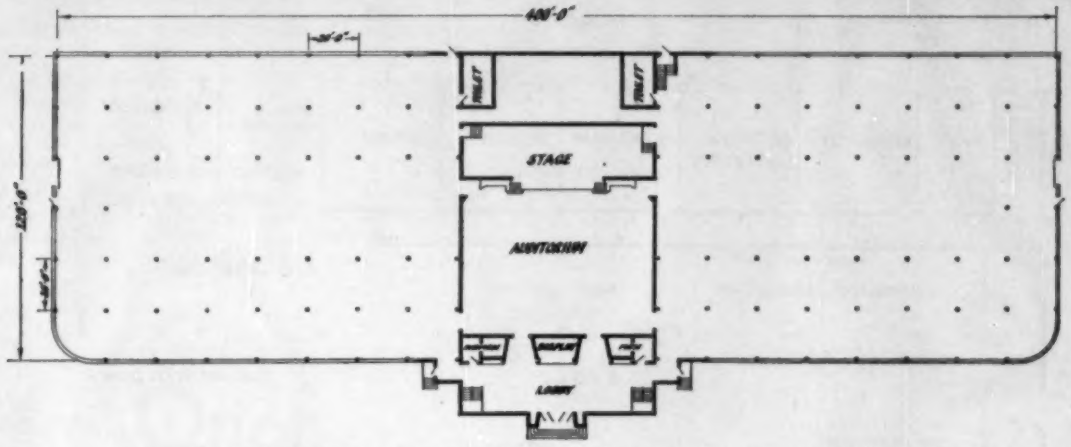
At the present time, only welding operator training courses are being offered to the students. But, as more of the interior facilities are completed and the necessary teaching arrangements can be made, it is planned to offer a variety of technical subjects and courses. It is expected to be able to offer this advanced work early in 1959.

This new school is an outgrowth of the Hobart Trade School which was started in 1930, and has since graduated over 20,000 weldors. As many as 190 students a day were trained during the peak of World War II. The increased use of welding and the growing need for specialized weldors (such as pipe weldors, boiler weldors, structural steel specialists, etc.) have all played a part in the growth of the present trade school. Today, as we enter the Rocket and Missile age with its thin critical metals and the problems of fabricating them, there is a great rush for training in tungsten inert gas welding.

The present courses offered by the Trade School for training welding operators are:

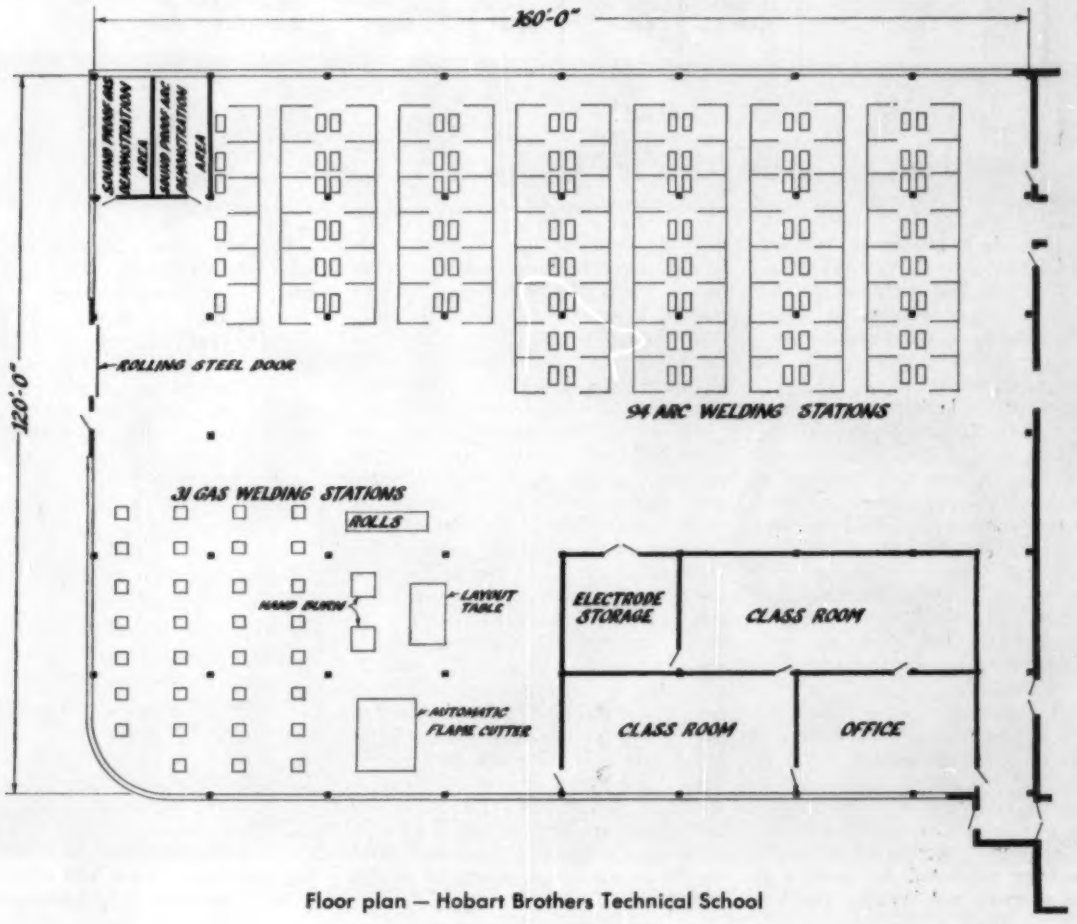
1. Metallic arc welding (both a.c. and d.c.)

Hobart Brothers Technical School at Westbrook

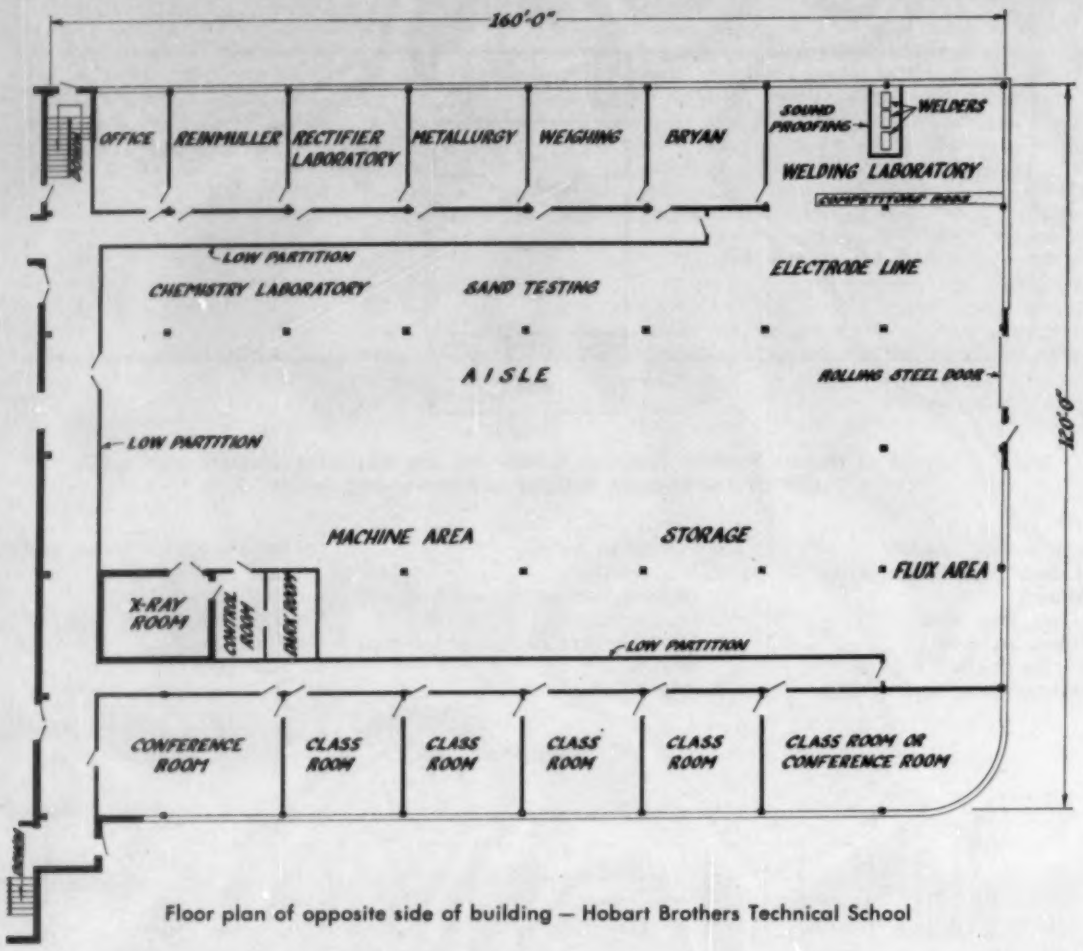


Layout of Hobart Brothers Technical School showing classroom areas to each side of the centrally located auditorium and lobby

2. Use of welding symbols
3. Automatic and semiautomatic welding
4. Welding alloy steels
5. Welding cast iron
6. Inert gas shielded welding
7. Hardfacing and tool welding
8. Carbon arc welding
9. Stud welding
10. Oxyacetylene welding and hand and machine cutting
11. Sheet metal fabrication and aircraft welding
12. Pipe welding
13. Weld specimen testing including X ray
14. Resistance welding
15. Induction heating
16. Metal spray
17. Shot blast
18. Tailor-made and refresher courses



Floor plan — Hobart Brothers Technical School



Floor plan of opposite side of building — Hobart Brothers Technical School

The school is in session 52 weeks a year and a new class starts every Monday at 8:00 a.m. The complete arc and gas welding course requires 16 weeks but it is possible to tailor-make a program of any length to meet specific individual requirements.

The Hobart Trade School is being expanded into the Hobart Brothers Technical School because there is a great and growing need for more skilled people in the welding industry. As new, more complicated welding techniques and processes are brought out at an increasingly rapid rate, there is a growing gap between the welding engineer and the welding operator. There is a demand for trained personnel, who not only know how to weld but who can readily adopt welding solutions to engineering problems — such persons or technicians as they may be called, could relieve engineers of a vast amount of engineering detail. They could do analysis work, equipment testing, handle many production problems, and take over much of the engineers' present paper work. It has been estimated by leaders in both government and industry that for the most efficient use of man power in our country, there should be from two to five people with technician-type training to assist each engineer. In 1960, there will be approximately 75,000 engineers graduated, for which there should be an estimated 375,000 technicians. However, at the present rate, only 16,000 technicians are expected to graduate that year. In 1955, out of 11,500 technical school graduates, only 101 were welding technicians, so it is quite obvious that there is a crying need for this type of training. The welding engineers and progress in the welding field are becoming increasingly hampered by this lack of competent technical assistance. A great deal of education must be done to point out what a price industry is paying for this shortage of welding technicians and also to demonstrate the job that technical school graduates can do. Most people are not too familiar with the capabilities and qualifications of people receiving this type of training. Only now are the metalworking and welding industries beginning to appreciate the growing requirement for welding technicians.

The new Hobart Brothers Technical School is coming at a most opportune time. Never has there been a greater need for the training that will eventually be available here. The plan, at present, is to offer the 16-week operator training course — this will serve as a nucleus or laboratory phase around which other technical courses will gradually be added. The welding technician courses will be:

a) The present welding operator training courses

plus

b) Basic electricity
c) Basic metallurgy
d) Blueprint reading, drafting, layout
e) Basic chemistry and physics as related to welding
f) Welding design
g) Strength of materials
h) Math through trigonometry
i) Specialized welding subjects based on AWS texts (i.e., codes, testing, safety, etc.)

It is anticipated that a complete welding technician course will require from 9 to 12 months. It is conceivable that

this program could eventually evolve into a two year Welding Associate or junior college type program which would mean offering the following possible courses:

1st Year

Welding (theory and shop)
Blueprint reading & shop drawing
Mathematics
English
Chemistry
Physics
Strength of materials
Safety

2nd Year

Welding (theory and shop)
Machine shop
Electricity
Metallurgy
Business management
Welding design
Testing
Codes

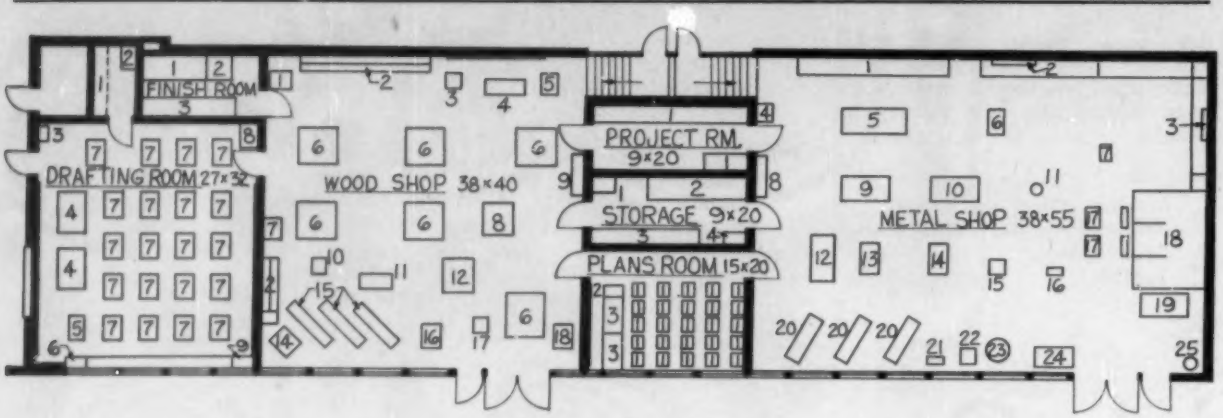
However, this last program is well in the future for now. New courses will be announced as they become available. Enthusiastic endorsement of this new school is anticipated from the welding industry where it will be filling a most vital need.

Lake Orion Community Schools

WALTER G. HAMPTON
Lake Orion, Mich.

Like many others in Southeastern Michigan, the school districts of Eaton, Howarth, Lake Orion, Webber, Carpenter, and Proper were beginning to feel the effects of overcrowding as a result of the bumper birth rate during and following the war years, and the continued migration of industrial workers to metropolitan and fringe metropolitan areas. Being anxious to meet the de-

The metalworking area at Lake Orion Community Schools
— Lens-Art Photo, Detroit, Mich.



Lake Orion High School

Drafting room: 1. storage shelves; 2. file; 3. sink; 4. large desk for perspective drawing; 5. teacher's desk; 6. print developer; 7. student desk; 8. metal storage cabinet; 9. printer

Finishing room: 1. drying rack; 2. metal storage cabinet; 3. paint bench

Wood shop: 1. jig saw; 2. tool panel; 3. grinder; 4. demonstration desk; 5. teacher's standing desk; 6. workbench; 7. drill press; 8. circular saw; 9. sink; 10. disk sander; 11. jointer; 12. planer; 13. lathe tool cabinet; 14. drill press; 15. wood lathe; 16. band saw; 17. miter box; 18. shaper

Project room: 1. small parts storage shelves

Storage room: 1. small wood parts cabinet; 2. metal rack; 3. lumber rack; 4. small metal parts cabinet;

Plans room: 1. student desk; 2. file cabinet; 3. teacher's desk

Metal room: 1. workbench; 2. tool panel; 3. welding panel; 4. teacher's standing desk; 5. sheet-metal desk; 6. squaring shears; 7. grinder; 8. sink; 9. layout bench; 10. forming bench; 11. bending machine; 12. metal band saw; 13. shaper; 14. mill; 15. drill press; 16. buffer; 17. gas welding; 18. arc welding; 19. molding bench; 20. metal turning lathe; 21. grinder; 22. heat-treat furnace; 23. gas forge; 24. air compressor; 25. melting furnace

mand of expanding enrollment, and to provide for the best education commensurate with the area economy, these school districts met with the Oakland County Board of Education on December 2, 1952, to discuss the advisibility of entering into an area study of the schools in the Lake Orion community. One of the findings of the resultant area study was the need for an expanded industrial-arts program in the high school to serve a consolidated school district.

Using a projected attendance estimate to determine the probable class sizes, and the article "Check List For School Shop Planning" in the October, 1954, issue of the *American Vocational Journal* for area/pupil ratio, the approximate sizes of the shop rooms were established. Then began a visitation program of industrial-arts shops in the area so that the Orion School District might learn the weak points and strong points in neighboring programs and might profit from their experience in shop planning. An evaluation of data thus gathered seemed to indicate a need for three shops; drafting, woodworking, and metalworking. These shops were specifically designed as unit shops to satisfy the need for an industrial-arts program with a vocational flavor. They were however organized and arranged so that a general shop program might be initiated if the need became evident. Shops were also arranged so that a student might conveniently pass from one room to another to complete a project involving more than one medium. A scale model was made of the floor plan, and model machines furnished by the South Bend Lathe Works, or made by the boys in shop classes, were placed on the floor plan to aid in determining the most desirable utilization of work areas.

Drafting room and woodshop at Lake Orion Community Schools

When the time came for the architect to incorporate the shop plan with the rest of the school building it became obvious that funds would not be available for as much shop as had been hoped for. It was necessary to reduce the size of the main shop rooms to some extent, but the auxiliary rooms suffered most. Subsequent operation of the shop has shown that the stock room, project room, and plans room would contribute much more to the shop program if they were larger. The finishing room, originally planned between the wood and metal shops so that it might be equally accessible to both, had to give way to hall and stairway. (See floor plan.)

At the present time the industrial-arts curriculum consists of three years of drawing, beginning general architectural, and machine; two years of woodworking, beginning and advanced; and two years of general metal and power mechanics, beginning and advanced. All shop classes are elective and available to male students only. A study is now in progress on the desirability of offering a nonacademic one-half credit course in hobbies and home maintenance which would be coeducational. It is hoped that this might develop into a unified arts course employing the industrial arts, homemaking, and art departments. All three of these departments are conveniently located in the same wing of the school building.

It is not intended that this plan be represented as ideal in every respect. However, experience has proved it to be a very workable plan and it is felt that every feature represents money well spent.

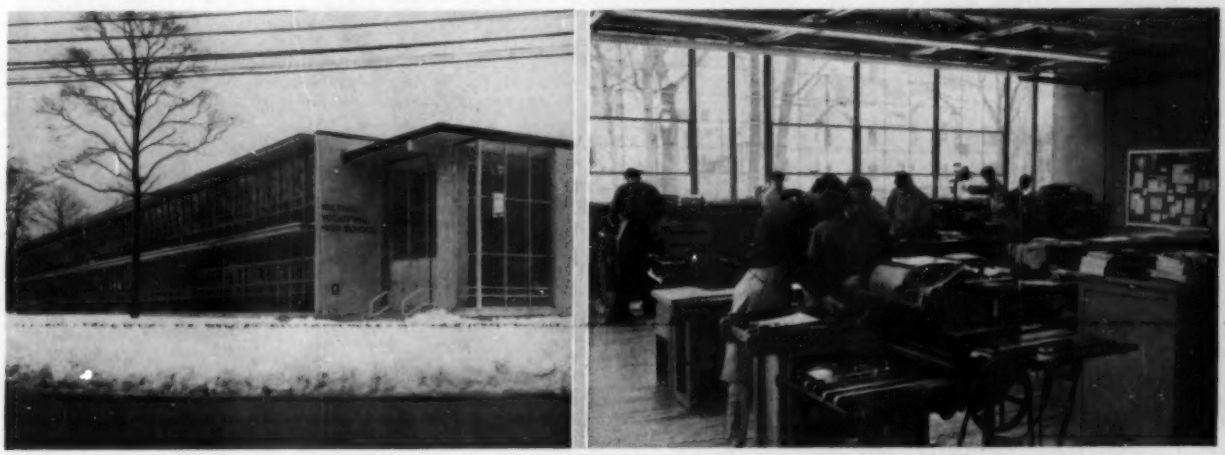
Waltham's Vocational High School

JAMES R. WESTALL
Vocational High School
Waltham, Mass.

At 100 Summer Street in Waltham, Mass., a modern and functional concept of vocational school plant construction is readily discerned in the newest of Massachusetts' separate state-aided vocational school buildings. Perhaps not as readily discerned, though it is certainly embodied in the design, is an associated concept of modern vocational educational organization and service.

Two impressions, we believe, are natural and immediate in a first viewing of Waltham's new vocational high school plant. The first and more distinctive impression is that the building expresses an industrial character combined with a professional aura. This is quite in harmony with trends observed in modern industrial plants dotting our New England landscape; plants in which professional research and planning facilities must be joined with conventional production facilities. It is likewise in harmony with the modern and growing concepts of vocational education.

The second impression is somewhat less distinctive but certainly no less im-

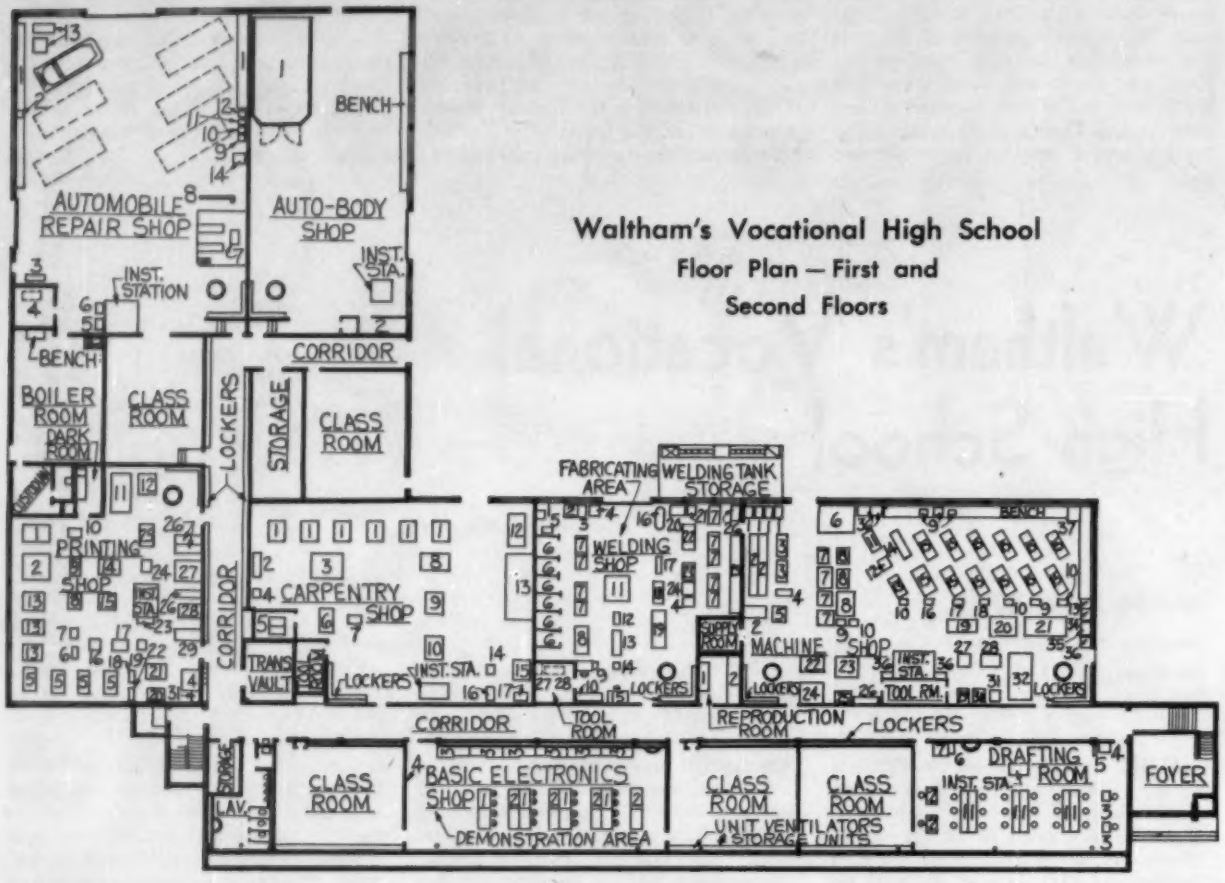


Main entrance and foyer, and at right, the print shop of the Waltham Vocational High School

mediate and natural. Sited in a well-kept and urban residential area, it is strikingly clear that careful planning had been directed to the arrangement and grouping of the shops versus the other school facilities so that, completed, the plant seems entirely and unobtrusively "in place" within its neighborhood.

Further viewing and objective study of the plant add to the favorable first impressions. Dignity, modernity, and attractiveness stand out in the lines and fashioning of this building. But what of its usefulness for the purposes which dictated the expenditure of public money for site and construction?

Waltham Vocational High School is



Waltham's Vocational High School

Floor Plan — First and Second Floors

First Floor

Machine shop: 1. oil drum; 2. stock rack; 3. metal band saw; 4. power hack saw; 5. band saw; 6. cylinder grinder; 7. milling machine; 8. surface grinder; 9. drill press; 10. tool grinder; 11. lathe (Wade); 12. pedestal grinder; 13. lathe (Wade); 14. lathe (Hardrige); 15. lathe; 16. arbor press; 17. belt sander; 18. speed lathe; 19. radial drill; 20. shaper; 21. shaper (hydraulic); 22. milling machine; 23–25. milling machines; 26. milling fixtures; 27. drill press; 28. tool cutter and grinder; 29. bench shaper. 30. surface grinder; 31. punch press; 32. planer; 33. snag wheel; 34. gas furnace; 35. electric furnace; 36. tool cabinet; 37. radial drill

Welding shop: 1. forge; 2. cutting table; 3. a.c. welder; 4. cooling bucket; 5. anvil; 6. welding booth; 7. welding bench; 8. layout bench; 9. desk and file; 10. tool cabinet; 11. vise bench; 12. square stake; 13. Ronald stake; 14. circular stake; 15. drawing table; 16. power hack saw; 17. shear; 18. rolls; 19. brake; 20. grinder; 21. drill press; 22. hydrogen bench; 23. heli-arc bench; 24. heli-arc welder; 25. stock rack; 26. rod storage; 27. rod cabinet; 28. air compressor

Carpentry shop: 1. workbench; 2. wood lathe; 3. thickness planer; 4. drill press; 5. electric service cub.; 6. band saw; 7. jointer 8. planer jointer; 9. radial arm saw; 10. tilt table saw; 11. belt sander; 12. dust collector; 13. stock rack; 14. shaper; 15. mortising machine; 16. scroll saw; 17. belt sander

Printing shop: 1. Miehle Vertical; 2. Heidelberg press; 3. Colt's armory; 4. Linotype machine; 5. double type rack; 6. mag. rack; 7. drying rack; 8. imposing stone; 9. drying rack; 10. roller rack; 11. camera; 12. print frame; 13–15. G. & P. Platen; 16. saw; 17. proof press; 18. cut cabinet; 19. galley rack; 20. folder; 21. bindery table; 22. wire stitcher; 23. galley rack; 24. drying rack; 25. offset press; 26. stock rack; 27. paper cutter; 28. bindery table; 29. layout table; 30. perforator; 31. paper drill

Automobile repair shop: 1. bench; 2. grinder-buffer; 3. lathe; 4. air compressor; 5. valve grinder; 6. electric chain; 7. front end aligner; 8. post lift (2); 9. portable grease gun; 10. battery charger; 11. battery and start tester; 12. volt and ampere tester; 13. engine overhaul; 14. wheel balancer

Auto body shop: 1. DeVilbiss paint spray booth; 2. tools and paint

Reproduction room: 1. ammonia printer; 2. bench and cabinet

Second Floor

Radio elec. shop: 1. workbench; 2. back bench; 3. storage unit; 4. chalkboard

Drafting room: 1. workbench; 2. drafting machine; 3. desks; 4. storage cabinet; 5–6. file cabinets; 7. paper cabinet

The electronics lab and at right, the carpentry shop at Waltham Vocational High School

dedicated in its distinctive assignment to the development of mechanical and technical skills useful in the work of the world. In industry, skills are shifting to higher levels increasingly associated with greater demands for accompanying technical competency. The vocational school must follow this trend and make the shift too. Waltham Vocational High is already a secondary school by classification. It seeks to become more truly so in organization, operation, and service. In the dignity, modernity, attractiveness, and in the dual professional-industrial character of this new plant the stage has been well set for the school to assume more completely and with advanced standards of achievement its distinctive role in the activities of the community.

The school, now at an advanced level of attainment, will continue to develop for its regular day school youth mechanical and technical skills useful in performing the daily work of the modern world. It will continue to afford the day school group an effective individual measure of general academic education. It will provide its graduates and adult workers of the industrial community with technical training at institute level through evening and other trade extension programs.

There is urgent need for engineers and scientists but even a greater need developing for highly skilled supporting craftsmen, draftsmen, and technicians. Without these the research scientists and engineers even now face alternatives of having their work come to naught for lack of its application in production service or having to devote their own energy to work that would be better done by practiced mechanics and technicians.

Architect's Notes and Summary Description

45,000 sq. ft. of plant for three year course to serve 350 students.

Statement of basic plans for utilization for architect's guidance developed in consultations with Superintendent of Schools, the Vocational School Director, and an Advisory Committee of participating industrialists. Standards for area allocations of space set up by State Vocational Division.

Co-ordination of utilities, mechanical equipment, etc., developed logically on basis of conference suggestions from instructors concerned.

Templates of each item of equipment

Auto body shop with the latest type paint spray booth, and at right, the wheel alignment area at Waltham Vocational High School

made, located, and submitted for analysis by each shop instructor.

Shops located with reference to relative levels of objectionable noise, vibration, and atmospheric pollution.

Shops completely equipped with latest types of tools and machines.

Oxygen and acetylene manifolds provided in attached building.

Standard safety color code used throughout the building.

Bus duct serving main shops provided with emergency shut-down switches.

Suitable hand fire-extinguisher distribution and automatic spray sprinklers protect shops.

Non-coded central fire-alarm system provided.

Special mechanical ventilation and balanced heated make-up air to remove atmospheric pollution.

Facilities for administration and management of the school designed and sited for specific functioning.

Related and classroom quarters equipped with black out devices for audio visual presentations.

Construction Notes

Structural system permits relocation of partitions at will.

No bearing partitions.

Second floor slab designed to permit live loading at any point.

Classroom and light-duty shop section is two-story, employing slab construction and porcelainized panel curtain walls.

Industrial portion is steel frame construction with open web steel joists.

Integrated lighting provided by top lighting with plastic dome skylights and flexibility circuit switching.

Floors: Corridors and classrooms asphalt tile; printing and carpentry shops maple; other shops poured concrete. Foyer, quarry tile floor.

Roof: Poured gypsum on mineral board forms and built up road surfacing.

All shops have wash and locker facilities, and toilet provisions are above state requirements.

Shop instructors' platforms are raised to permit better supervision of shops.

No special acoustical treatment provided, as materials of construction and roof forms secure excellent results.

A complete centrally controlled communication system includes radio reception, record reproduction, two-way communication by speakers and other flexible arrangements of communications.

Heating is by oil-fired, steam packaged type boilers, using cabinet heaters and unit heaters.

Special provisions include: radiant floor panels for auto shop, runway from auto shop to auto related instruction room. Print shop positioned for most favorable lighting potential.

Industrial Arts Offers Many Courses

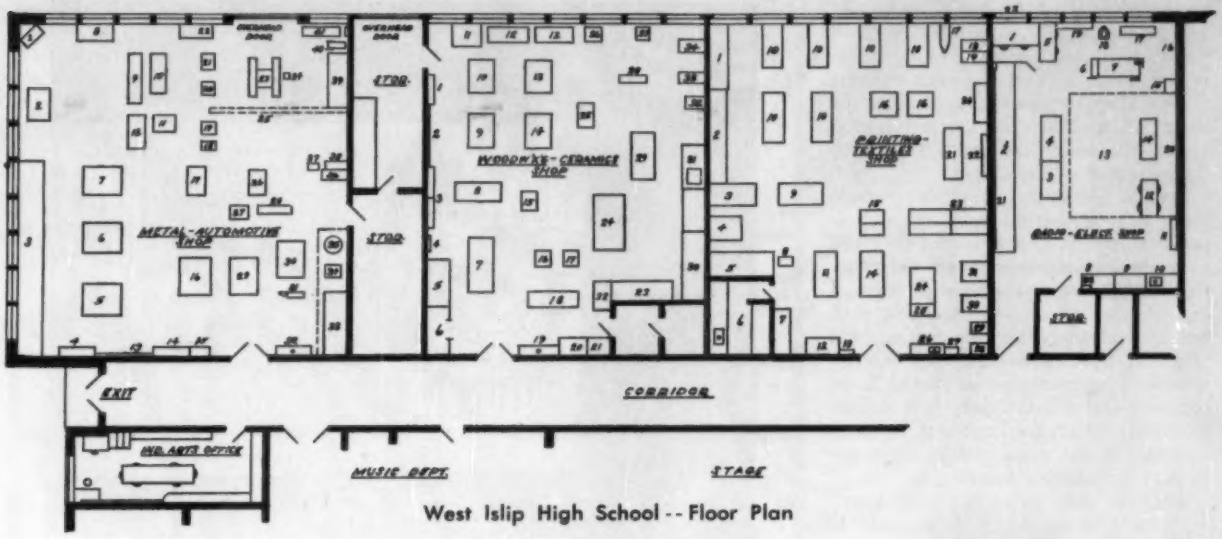
WALLACE MILLARD
Chairman, Industrial Arts Department
West Islip Public Schools
West Islip, L. I., N. Y.

The industrial arts program in the new high school now provides our students with broad and complete training in many basic crafts. Five areas are used to teach the following skills: metalwork, electricity, and auto mechanics, woodworking and ceramics, printing and textiles, radio and electronics, mechanical drawing.

Mechanical drawing is taught in the central part of the school, while the shops, along with the music rooms, are in the north wing. This prevents disturbing the academic classes; in addition, sound absorbing ceilings lower the noise level.

Although planned for freshman to senior students, our industrial arts pro-

Shop department looking in from the storage area. At right, project and lumber storage area



West Islip High School -- Floor Plan

Metal-Automotive Shop

1. Storage cabinet; 2. squaring shear; 3. workbench and planning center; 4. tool cabinet; 5. bench with rotary machine; 6. bench with bar folder; 7. bench with pan brake; 8. bench, lathe layout; 9–10. 10-in. lathes; 11. milling machine; 12. 9-in. lathe; 13. blackboard; 14. tool cabinet; 15. main switch panel; 16–17. stake bench; 18. tool grinder; 19–20. drill presses; 21. shaper; 22. spinning lathe; 23. hydraulic lift; 24. floor drain; 25. trolley hoist; 26. live engine; 27. band saw; 28. hacksaw; 29. layout bench; 30. foundry bin; 31. anvil; 32. sink; 33. soldering bench under hood; 34. gas muffle under hood; 35. melting pot under hood; 36. bar stock rack; 37. arbor press; 38. auto tools; 39. auto bench; 40. gas welding; 41. compressor

Woodworking-Ceramics Shop

1. Tools storage; 2. tool panel; 3. tool and small parts cabinets; 4. switch panel; 5. bench; 6. spray booth; 7. glazing table; 8. planning table; 9–10. benches; 11. belt sander and collector; 12. lathes; 13–14. benches; 15. drafting table; 16. treadle wheel; 17. powered wheel; 18. kiln stacking bench; 19. sink; 20. Stewart kiln; 21. Hotpak kiln; 22. wedging bench; 23. slip casting bench; 24. whirler bench; 25. circular saw; 26. drill press; 27. grinder; 28. jointer; 29. glue bench; 30. modeling bench; 31. finishing bench; 32. band saw; 33–34. jigsaws

Printing and Textiles Shop

1. Yarn storage; 2. bench; 3. cutting table; 4. 19-in. paper cutter; 5. bindery bench; 6. darkroom; 7. rubber stamp making; 8. staple stitcher; 9. loom table; 10. loom and warp tables; 11. silk screen table; 12. drying rack; 13. switch panel; 14. silk screen table; 15. type cabinet; 16. 4-harness floor looms; 17. ironing board; 18. treadle sewing machine; 19. powered sewing machine; 20. cutting table; 21. demonstration bench; 22. blackboard; 23. double type cabinets; 24. imposing table; 25. proof press; 26. sink; 27. ink cabinet; 28–29. lever presses; 30. 8 by 12 letterpress; 31. 10 by 15 letterpress

Radio-Electric Shop

1. Amateur radio station; 2. wiring and testing benches; 3. sanding, finishing; 4. coil winding bench; 5. short wave listening and monitoring bench; 6. pan brake; 7. bench; 8. buffer; 9. chemical bench; 10. sink; 11. bookcase; 12. planning table; 13. lecture area, folding chairs; 14. demonstration bench; 15. portable TV bench; 16. tool panel; 17. engine lathe; 18. drill press; 19. Univent; 20. chalkboad, power strip under; 21. corkboard, power strip under

gram also includes the seventh and eighth grades. This present flexible and varied program is possible because the relatively small enrollment in the upper classes offsets the large number of junior high students. Courses at the high school level include comprehensive general shop, general metal, general electricity, general woodworking, general printing, and general radio; the advanced courses are machine shop, cabinetmaking, and auto mechanics. The mechanical drawing program consists of beginning drawing, machine design, gears and cams, and architectural drawing.

The features of the shops deserve description. Lighting, both natural and artificial, is very good. Full ceiling height windows cover one complete wall in all shops. The metal shop, a corner room, has two window walls. Fluorescent lighting, with each strip of fixtures on an individual switch, provides excellent diffusion throughout the area. Lighted glass cabinets in the corridor walls provide display space near each shop.

Power for each shop is provided at 220 volts, 3 phase, 60 amperes. Special trip switches are provided for the instructor to cut all power circuits at any time. Four wires at the power outlet boxes provide a selection of voltages — 220 v. 3 phase, 210 v. 1 phase, or 108 v. 1 phase — which allows for maximum flexibility in tooling arrangements. Machines are protected both by thermal circuit breakers at the machine and by fusing at the entrance board. These separate lines are in turn protected by a 60 ampere fuse which leads to the main supply line.

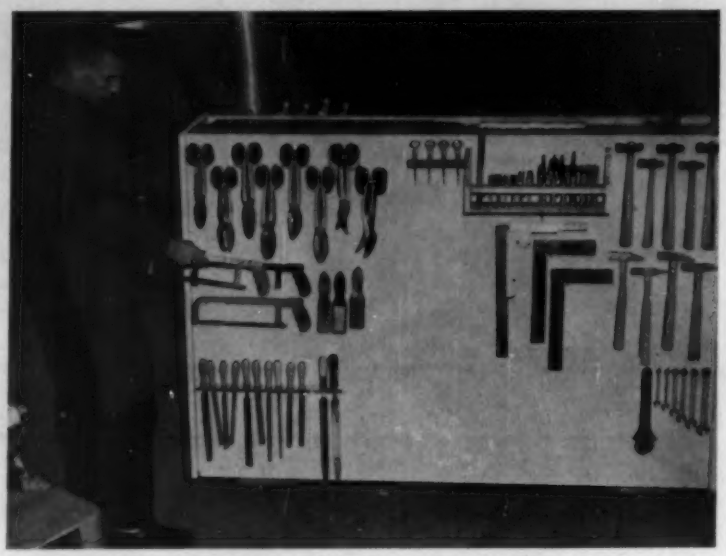
Outlet strip on three walls in the radio-electronics shop is divided into separate circuits at the main box. External bronze grounding rods and a Plexiglas window panel allow easy installation of antenna feed lines. The wood and metal shops contain large storage areas equipped with overhead doors for unloading of supplies. A similar area in the printing-textile shop contains a complete darkroom facility. Adequate cabinet storage is provided for all areas. To conserve wall space tool cabinets are used in preference to open tool panels except for woodworking and printing areas. The ceramics area has a damp storage room and a drying room.

Special facilities worthy of mention may be found in each shop. The metal area contains a hooded and ventilated foundry and forging section with a special power outlet for arc welding

near the hood. A hydraulic car hoist and an electrically controlled overhead trolley hoist are furnished in the automotive unit. A buried forced exhaust system allows engines to be run in the shop. All machines in the metal shop are of the heavy industrial type with the exception of the shaper.

Special ceramics facilities include both a foot-powered and an electric potter's wheel. Two large electrical kilns, one front-loading and the other top-loading, are equipped with thermal cutoffs. An adequately trapped sink provides cleanup for slip-casting and other ceramic activities. Noteworthy woodworking machines include a 20 in. bandsaw and a heavy duty belt sander. Electrical outlets are located at frequent intervals in the wood area to allow use of portable sanding machines.

Because the printing and textile equipment is varied, it is possible to present a flexible program to the students. Two Chandler and Price powered letter presses, two Craftsman hand presses, and a Vandercook proof press are adequate for the present scope of the printing program. Rubber stamp making, silk screen printing, and bookbinding areas lend variety to the activity. The textiles area takes up approximately half the floor space in the shop and is well equipped. Two four-harness floor looms, 20 table looms, and 20 special purpose looms allow for a variety of weaving. Two industrial type sewing machines give the students an opportunity to make their own aprons, duffel bags, and other miscellaneous canvas oddments.



Picture of portable "A" type tool panel. Woodworking tools on one side, metalworking tools on the other side

The radio-electrical shop, begun this year, is not entirely completed although it is in use. Complete testing and demonstration equipment is available, including multimeters, signal generators, regulated power supplies, oscilloscopes, vacuum tube voltmeters, battery testers, a tube tester, and other instruments which may be used in teaching electronic circuitry. An amateur radio station will be set up and operated as soon as location, antenna, and local noise problems have been solved. The building layout is such that a variety of antennas may be erected with very little difficulty, even with the larger types.

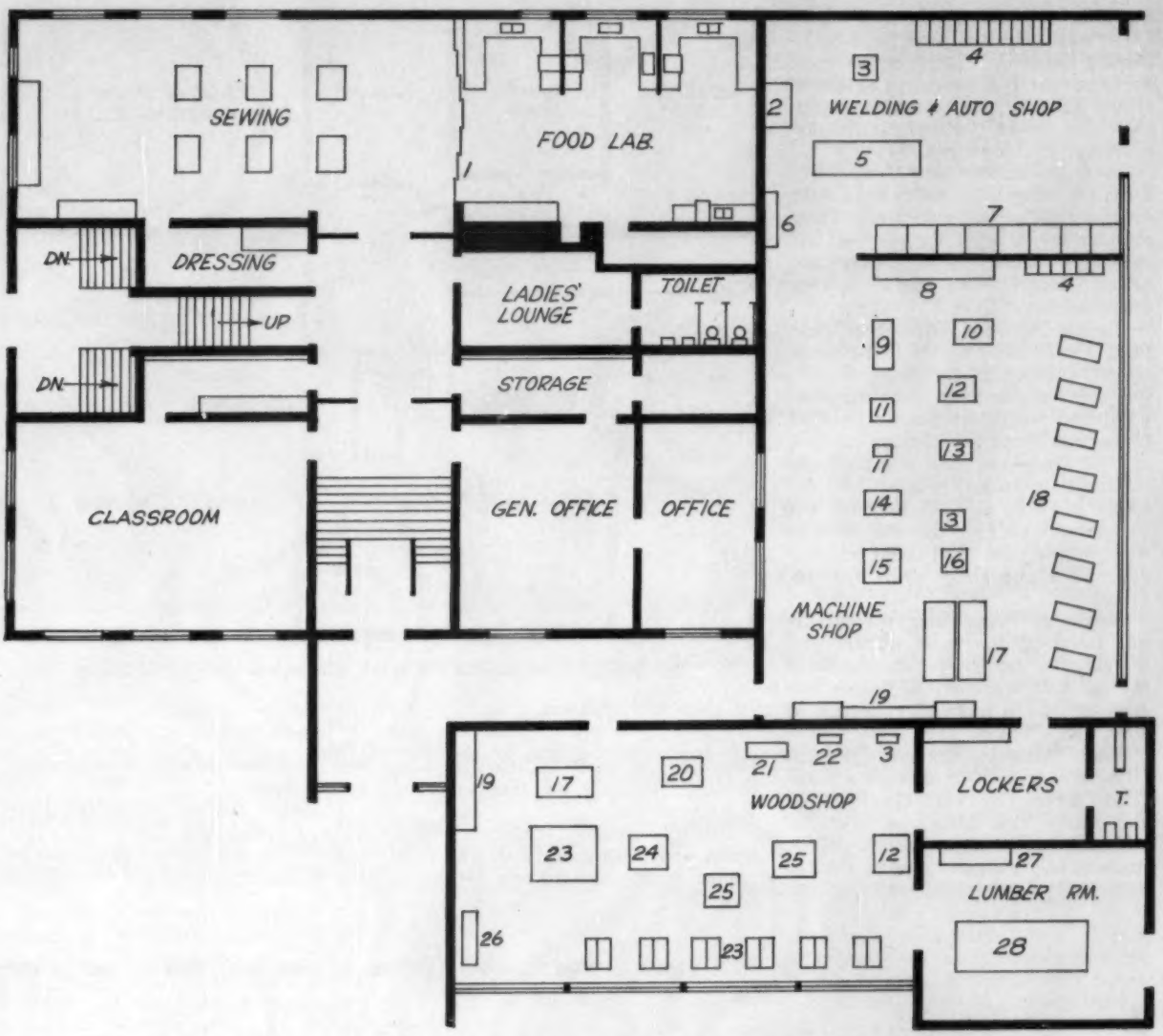
Additions and Alterations to the Vocational School, South Milwaukee, Wis.

JOSEPH LONGO
Director, School of Vocational and Adult Education
South Milwaukee, Wis.

In 1955 plans were made to move from a wing of the high school building to a sixty-year-old elementary school building with the provisions that money be provided for remodeling and building a shop addition to meet the needs of a vocational school.

An architect was engaged and plans drawn up for an extensive building program. The actual cost exceeded the estimate by quite a bit so it was decided to delete as much as possible and go ahead with the money available and spread the remaining work over a period of a few years to facilitate moving and resettling.

The existing building consisted of a boys' and girls' lavatory, boiler room, coal room, storage room, and an all-purpose room on the ground floor; four classrooms and four cloak rooms on the first floor; four classrooms, a nurse's room, a utility room, and four cloak rooms on the second floor; a stairway on the East side and West side leading



First floor plan – School of Vocational and Adult Education, South Milwaukee, Wis.

1. Folding door; 2. cabinet; 3. grinder; 4. lockers; 5. gas-welding bench; 6. electric panel; 7. arc-welding booths; 8. stock rack; 9. turret lathe; 10. horizontal mill; 11. drill press; 12. band saw; 13. power hack saw; 14. shaper; 15. vertical mill; 16. surface grinder; 17. workbenches; 18. lathes; 19. tool crib; 20. planer; 21. jointer; 22. mortiser; 23. benches; 24. shaper; 25. circular saws; 26. wood lathe; 27. blower; 28. lumber rack

to the first floor; and a stairway on the North Side and South side leading to the first and second floors.

The north and east stairways were ripped out and floored over. On the ground floor a door was placed across the passageway next to the boy's lavatory and an electrical laboratory for the training of electrical apprentices was installed. The area left by the north stairwell had a concrete floor and an exhaust fan put in and a space 15 ft. by 17 ft. provided for a foundry room. The all-purpose room was left as it was and made available for related training for apprentices, English and Americanization classes, driver-training theory, visual education, and Golden Agers. It also was used for short extensive training programs for industrial engineers. In the girls' lavatory the partitions, toilets, and wash sinks were removed, a ventilating fan installed, and the room which was 23 by 31 ft. was fitted with cabinets and storage space and this became an upholstery shop. The place where the north stairway and partitions of two classrooms were removed on the first floor, became a sewing room and home economics food laboratory with five kitchens separated by a folding door. Part of one cloakroom and a closet next to the sewing room were partitioned and made a dressing room. The area that was formerly the east stairway was floored over and a women's lounge and toilet room was installed. One classroom remained as it was but the remaining classroom was partitioned into a general office and director's office.

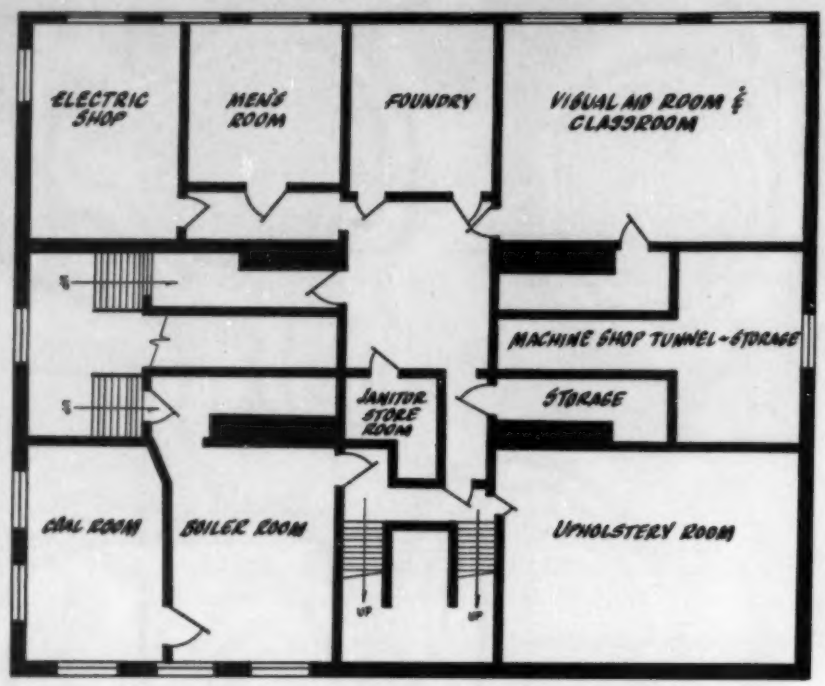
The second floor remained practically

the same except for gaining a 15 by 17 ft. room which is used for a bookkeeping classroom. The other rooms are used respectively for regular classrooms, typing and machine calculating room, shorthand room, related instruction room, and drafting room.

An approximately 5000 square foot L-shaped wing was built on to the existing building for shop areas. These shop areas are used for gas and arc welding, machine shop, locker and project storage room, lumber storage room, and woodshop.

During Christmas vacation of 1956 tiling was installed on the first floor of the old building. In the spring of 1957 the old building was completely rewired and fluorescent fixtures installed throughout. During Christmas vacation of 1957 the second floor was tiled and rubber stair treads installed. In the spring of 1958 the old building was tuckpointed and all the old windows were ripped out and solar-selecting glass block and vision strips were installed.

Outside of reasphalting the parking lot, replacing the worn gutters and downspouts, and painting the outside of the old building; the building is now complete and is serving its function as a vocational school.



The ground floor plan of the South Milwaukee Vocational School

South Milwaukee was one of the first cities in Wisconsin to organize a Vocational School, in 1912. The fact that this was a new system of education without tradition or precedent to follow, made it very difficult. Tracing the history of the local school would show a very humble beginning with a gradual growth in ideals and accomplishments. It took a long time to educate the public that learning concerned itself mainly, not only with the child, but that the community had a responsibility toward the teaching of young workers and adults how to live and earn a living as well. The new philosophy believes that those who are earning should have an educational opportunity of learning.

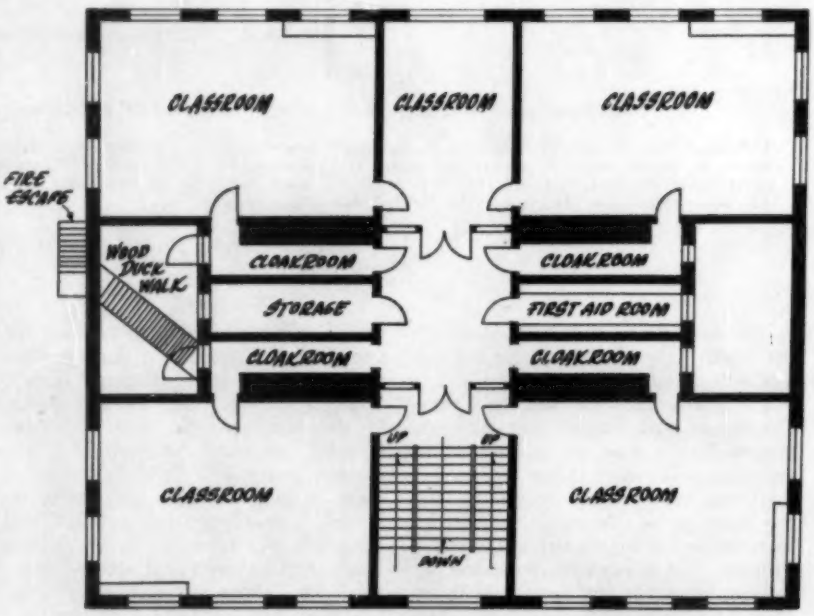
Vocational education is not concerned with a method or plan, but it is concerned with the individual and his promotion and advancement so that he may become a better citizen, serve better and earn more. It is an all-inclusive form of education in that it takes the student while young in its day school and supplements what he did not get through choice or circumstance in the regular full-time school and carries him along while in his vocation through the upper stages of adulthood in its evening school.

The activities in the South Milwaukee Vocational School are grouped into two divisions, the day school and the evening school. The students in the day school are classified according to the time spent in school. These classifications are: part time, half time, full time, and apprentices.

Part-time students attend one day a week, and consist of those who have regular employment outside the home, and other specials who desire to attend on this basis.

Half-time students attend the equivalent of ½ day each day.

Full-time students are those who enroll in the school for a daily full-time



Second floor plan of the South Milwaukee Vocational School

Exterior view of building showing new glass blocks and vision strips
— Photographs, R. F. Hildebrand, Milwaukee, Wis.

program. This period of enrollment may be for a week, a month, a semester or another period depending upon their status of employment.

Apprentices attend school as a part of their indenture, four to eight hours a week where they receive special and technical instruction directly related to the trade they are learning.

The evening school is open to all citizens of South Milwaukee over the age of 16. The curriculum of the evening school depends upon the facilities available and the demands of the students. The following courses are typical of those offered in the evening school program: English and Americanization, Spanish, shop mathematics, bookkeeping, machine calculating, shorthand, typing, mechanical drafting, blueprint reading, machine shop, welding, beginning clothing problems, advanced dress construction, tailoring, millinery, home care of the sick, interior decorating, rug hooking, knitting and yarn crafts, slip covers and draperies, parenthood, cake decorating, table decorations and favors, family life, human relations, investments and securities, job evaluation, time and motion study, upholstering, art, legal matters, leathercraft, woodworking, bridge, and automobile driving. The school also sponsors the homemakers club.

The school employs four day school instructors and on a rotating plan, circuit teachers come in for a semester or a whole year to give specific trade preparatory and trade extension training in foundry and electricity and human relations.

Money for the promotion and development of some of these training programs comes from three sources: federal, state, and local. Federal aid is granted on a matching basis, while state aid is received depending upon the amount spent for instruction. State and federal aid amounts to 17 per cent of the total budget.

Members of the Board of Vocational Education are two employer members, two employee members, and superintendent of schools as ex-officio member.

The first classes were held in what is now a residence. There being no facilities for trade training, the work offered was mainly academic, supplemented by University Extension work in drafting.

In 1914, an instructor was obtained to organize the work in home economics for the girls, using high school facilities from four to five o'clock each afternoon. Later the other class work was transferred to the third floor of the old high school building, which was destroyed by fire in 1929.

During this early period, class work was again transferred to the original building and then back to the old high school. After the fire which completely destroyed this building, a wing of the high school was built and occupied in the spring of 1931 for Vocational School purposes.

The vocational education services that have been developed in the local school are in harmony with the principle that the needs of the student shall determine the curriculum. Adherence to this policy has fostered a close coordination in planning and advancing instructional programs that serve the community needs.

Drafting class at the Vocational school at South Milwaukee, Wis.

William H. Danforth Industrial Arts Building

RUDE OSOLNIK
Chairman, Industrial Arts
Berea College
Berea, Ky.

A glance at the catalog of Berea College for 1892 shows the curriculum to be strongly classical. One might easily form the impression that the only industrial arts within the scope of the program were to be found in allusions to the craftsmanship of Hephaestus, fabled creator of beautiful gifts in wood and metal for ancient gods and heroes.

Such an impression would be wrong. It is true that Berea College has always emphasized liberal arts, but for almost three quarters of a century industrial arts have been a significant part of the curriculum.

In 1890 President William G. Frost reported "a good beginning" in industrial arts, and by 1893 the catalog included a statement that "education cannot be gathered primarily from books," that "the hand must be trained to obey the mind, and the eye to distinguish between things which differ" and that "every young person should be taught to enjoy doing manual work well, both as a preparation for real life, and as a development of character." The philosophy expressed in these lines later became an integral part of the famed Berea labor system, which is based on the idea that work and study should go hand in hand.

As this whole pattern of thought grew, the industrial arts program at Berea continually expanded, requiring the addition of new courses, new equipment, and new staff members. Soon more roomy quarters were called for, and by 1900 plans for a new building were under consideration. On October 18, 1902, Robert Todd Lincoln, head of the Pullman Company and son of the Civil War President, provided a Pullman car to bring distinguished guests to Berea for the laying of a cornerstone for a new industrial arts building.

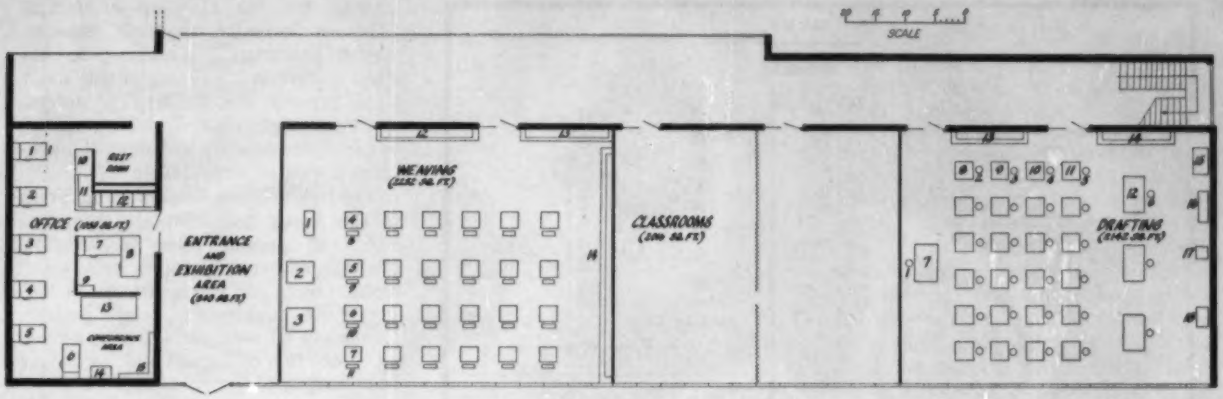
Continuing expansion of the program over the years saw the spreading of units of the industrial arts program into various buildings scattered over the campus, until a need for re-centralization led the trustees, in 1946, to authorize the drawing of plans for a new plant which would house under one roof all the college's many activities in the field.

This was particularly needed because most of the earlier Berea industrial arts curriculum had been on the secondary and vocational level, a great proportion of the early work of the whole school being directed at persons who lacked high schools in their own communities, and the rise of a new situation, in which industrial arts work at the college level was indicated, pointed up a need for a new and larger building.

The architect's plans, as submitted would have entailed the expenditure of some three quarters of a million dollars, approximately twice the amount envisioned by the board. Under the pressure of other needs, the trustees therefore shelved the plans, hoping that ultimately some friend of the college might offer to make up the extra sum.

The friend was found in 1955 in the person of William H. Danforth, of the

William H. Danforth Industrial-Arts Building



William H. Danforth Industrial Arts Building

Office

1–9. Desks and filing cabinets; 10. safe; 11–12. filing cabinets; 13. table; 14. magazine rack; 15. book shelves

Weaving

1. Warping reel; 2–7. looms; 8–11. stools; 12–14. cabinets and sinks

Drafting

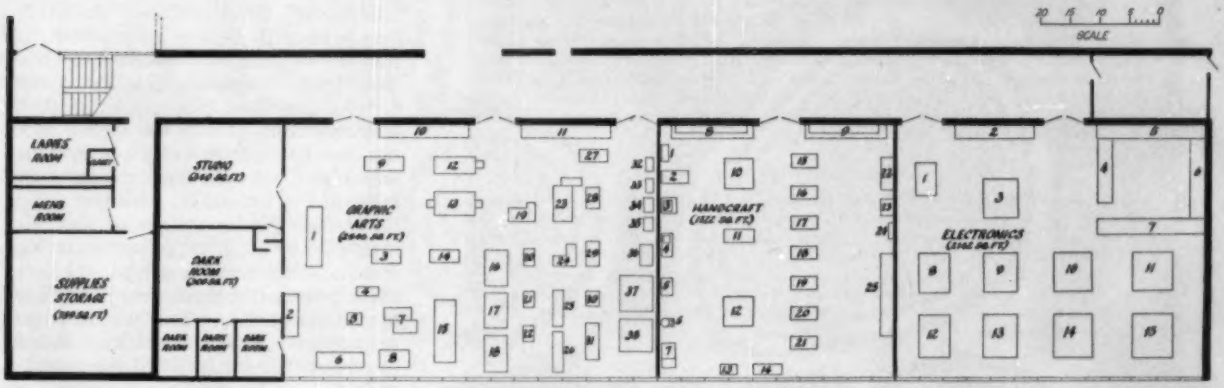
1–6. Stools; 7. table; 8–12. drawing tables; 13–14. cabinets and sink; 15–16. cabinets; 17. blueprinting machine; 18. vertical printing machine

Ralston-Purina Company of St. Louis, who made available a general grant of funds "for the erection of a new industrial arts building." With the promise of the gift, the industrial arts staff of the school was called upon to re-evaluate needs of space and equipment, and it was finally decided to commission a new architect to design a completely new plan, which would meet anticipated needs of the program during at least the next twenty-five years, and would equip the school to provide for a college curriculum leading to the B.S. degree in industrial arts education.

Named for the donor, this splendid addition to the Berea campus was begun in the spring of 1957, and dedicated on September 27, 1958, although it had been in use for classes since the opening of the fall term in September.

Of attractive contemporary design in brick, enameled curtain-wall and block, emphasizing a sense of openness, airiness, and light it is an impressive and fitting memorial to a man who, through many years of service on Berea's Board of Trustees, had shown an untiring interest in the problems and the advancement of mountain youth in the Appalachian region served by Berea College.

The Danforth Industrial Arts Building, located on Walnut Meadow Pike and standing not far from the center of the campus, represents in its plans the work of many individuals, some of whom had left the scene before the actual blueprints were begun. Their suggestions as to needs, possible expan-



Handcraft

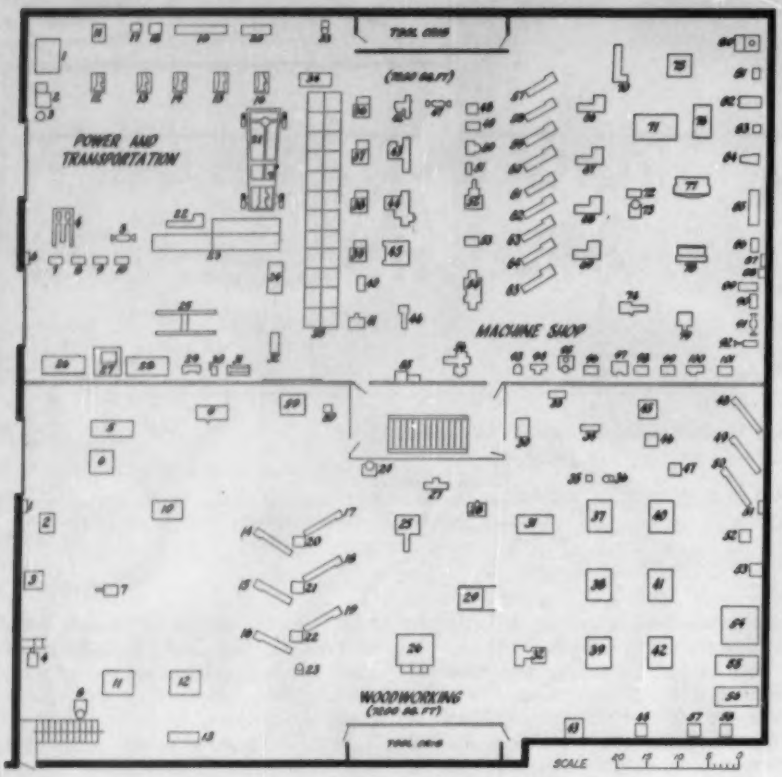
1. Cabinet; 2–4. kilns; 5. buffing machine; 6. drill press; 7. Highland Park grinder; 8–9. cabinets and sink; 10–11. benches; 12. layout table; 13. shopsmith; 14. sewing machine; 15–21. benches. 22–25. cabinets

Electronics

1. Cabinets and sink; 2. instructor's table; 3–11. benches; 12–14. cabinets; 15. bench

Graphic Arts

1. Planning table; 2. printing frame rubbing table; 3. Little Giant press; 4. Multi-lith; 5. layout table; 6. offset camera; 7. make-ready table, roller rack ink storage; 8. offset press; 9. desk; 10–11. cabinets and sink; 12. bindery table, perforator; 13. bookbinding, paper drill, stitcher; 14. press table; 15 Kelly press; 16–18 platen press; 19. folding machine; 20. makeready table; 21. chase rack ink supply; 22. makeready table; 23. proof reading, paper cutter table; 24. mitering router, strip material; 25–26. type cabinets; 27. desk; 28. wrapping table; 29. imposing stone; 30. ink storage, proof press; 31. correcting and dumping; 32. stereo type; 33. sing. caster; 34. Ludlow matrices; 35. Ludlow casters; 26. Linotype workbench; 37–38. Linotypes



William H. Danforth Industrial Arts Building
Power and Transmission, Machine Shop

1. Bench; 2. Allen tune-up, and spark-plug cleaner; 3. flexible shaft grinder; 4. hoist; 5. demonstration engine; 6. sink; 7–10. cabinets; 11–16. engines; 17–20. cabinets; 21. chassis; 22. lathe; 23–24. benches; 25. drill presses; 26. bench; 27. Allen Syncrograph; 28. bench; 29. valve grinder; 30. arbor press; 31. motor; 32 power hack saw; 33. drill press; 34. bench; 35–40. cabinets; 41. abrasive cut-off; 42. cutter grinder; 43. knife grinder; 44. cylindrical grinder; 45. disk grinder; 46. power hack saw; 47. grinder; 48. 4-ton arbor press; 49. 8-ton arbor press; 50. drill press; 51. cabinet; 52. band saw; 53. cabinet; 54. shaper; 55. cabinets; 56. horizontal milling machine; 57–65. lathes; 66–69. cabinets; 70. metal cutting band saw; 71–72. layout tables; 73. 14-in. drill press; 74. shears; 75. welding tables; 76. bench; 77. shears; 78. folder; 79. band saw; 80. forge; 81.–85. welders; 86. lathe, 87. cabinet; 88. sink; 89. shaper; 90. cabinet; 91. buffing machine; 92. welder; 93. water fountain; 94. abrasive cut off; 95. drill press; 96. cabinet; 97. belt grinder; 98–99. cabinet; 100. belt sander, 101. cabinet.

Woodworking

1. Sink; 2. shaper; 3. mortiser; 4. tenon machine; 5. jointer; 6. planer; 7. band saw; 8. drill press; 9. over-arm cut-off saw; 10. table saw; 11–13. benches; 14–19. lathes; 20–22. cabinets; 23–24 drill presses; 25. band saw; 26. sander; 27. jointer; 28. over-arm cut-off saw; 29. table saw; 30. miter saws; 31. shaper; 32. 20-in. disk and spindle; 33. 6-in. belt sander; 34. jointer; 35. jig saw; 36. drill press; 37–42. benches; 43. jig saw; 44. lathe; 45. planer; 46. table saw; 47. shaper; 48–50. lathes; 51. cabinet; 52. grinder; 53. sink; 54. spray booth; 55–56. benches; 57. bench milling machine; 58. 6-in. metal bench shaper; 59. conveyor; 60. sweep hole

sion of program, and general hopes for the industrial arts curriculum at Berea, were remembered and incorporated, however, by present staff members, along with current ideas and the advice of the architect.

In the final agreement on plans, several basic factors were taken into account: State requirements for teacher certification (since Berea is a teacher-training college), the Kentucky Industrial Arts Curriculum, needs of teachers of industrial arts throughout the area as expressed by Berea alumni now in school positions outside Berea, anticipated curriculum needs, vocational aspects for teacher training, suggestions for a demonstration center for new Berea philosophies of industrial arts work, the use of new and economical materials in the whole industrial arts program, and anticipations for future expansion and growth.

The floor plan represents a building of approximately 53,000 square feet, situated on a sloping site which has allowed five different levels, yet with each one having direct access to the outside without the use of steps or ramps. (This, incidentally, made it unnecessary to construct fire escapes, an unusual feature in a building of this size.)

At present the building is accommodating approximately 175 students, but facilities actually will support a program taking in some 350 to 400.

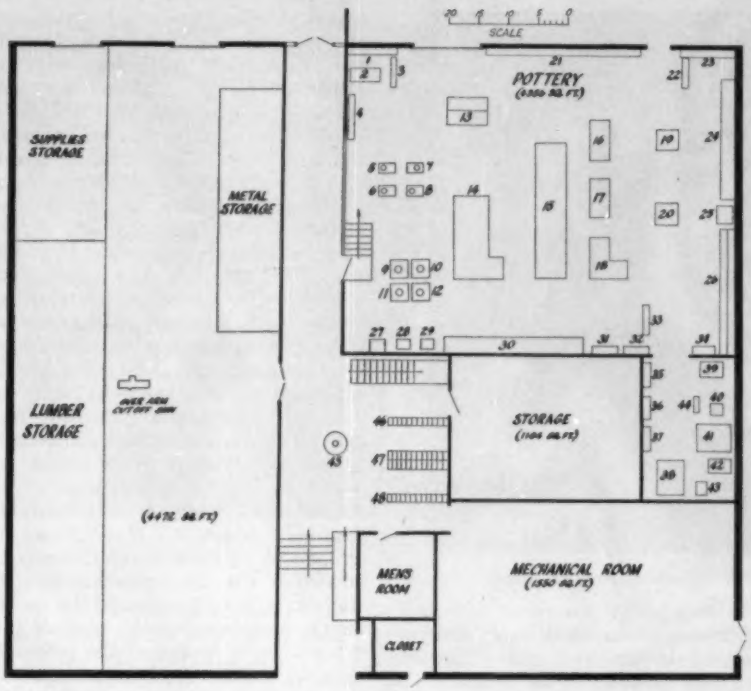
The building makes room for all areas of the Berea industrial arts program, which at present takes in weaving, drafting, electronics, graphic arts, wood, metal, power and transportation including auto mechanics, and pottery. Courses in all these activities are offered on both the collegiate and secondary level, and in conjunction with the woodworking section, classes are offered to the adults of the community, and time is provided during the day for an extracurricular activity whereby any student or faculty member may, for his own interests, use equipment in the building.

The office, weaving, and drawing sections are located on the street level, together with exhibition areas. All offices of the staff are centrally located, mirroring a philosophy of unified purpose which aims at having the student see the field as one endeavor with many branches; staff members thus associate daily and work together instead of having private little domains in separated parts of the building.

Storage for materials and supplies is provided in three separate storage areas so that all shop space can be utilized for instructional purposes. These storage facilities are located on the building's fourth level, directly beneath the main shop area, with a conveyor provided to transfer supplies and materials to the shop level. A loading platform gives direct access from the outside, so that materials brought into the supply section can be transferred by conveyor to any other level. The main storage area takes in 140 by 160 ft., with two additional facilities for storage of approximately 30 by 30 ft. each. Lumber racks, metal racks, and numerous cabinets make possible the permanent protection of materials and supplies, in most cases according to design especially tailored to meet particular needs of the department.

The third level of the building provides instructional space for the electronics laboratory, the craftsroom, and the graphic arts area. A direct duct of nonmagnetic aluminum to the roof from the electronics area provides for all antennae wires. For instructional work both a.c. and d.c. are furnished to every work station, in a range between 24 and 220 volts, single or three-phased.

Approximately 3200 square feet is allotted to graphic arts, where facilities will be found for photography, offset



Pottery

1. Bench; 2. table; 3–4. shelves; 5–12. potter's wheel; 13. bench; 14. bench and sink; 15. bench; 16–18. shelves; 19–20. wheel carts; 21. bench; 22. shelves; 23. bench; 24. cabinet; 25. spray booth; 26. cabinets and sink bins; 27. lamp cupboard; 28–29. wedging boards; 30. bench; 31. blunger; 32–33. stock bins; 34–35. shelves; 36–37. stock bins; 38–43. kilns; 44. temperature recording unit; 45. industrial-type wash basin; 46–48. lockers

points, so that they are checked out directly for use in the various work areas.

Ventilating and heating units are one, fresh air being drawn through filters over steam heated radiators and delivered to the various areas of the building by ducts located in false ceilings in the hallways, and in the same room which houses these units are also located an air compressor, dust-collecting system, and power-control panels for all building areas. Duct work anticipates the eventuality of air conditioning throughout the building. Dust collected from the wood area by ducts underneath the floor, is removed by a system which is so arranged that all shavings and dust are withdrawn from the undersides of machinery, thus eliminating all overhead ductwork. Floorsweeps are also provided for the elimination of excess dust and shavings not caught by machine contacts. The blower for this system is located outside the building, at a distance of approximately two hundred feet.

Compressed air is delivered to all shop areas requiring it, and enough outlets are provided so that fifty feet snap-on hose for cleaning purposes will reach all parts of any shop. Compressed air is also available for the electric benches and spray booths. Fumes from welding booths, soldering benches, printing, silk screen printing, block printing, California typecase setting, casting, linotype, job press, and flat bed press printing.

The crafts section contains space and equipment for basketry, enameling, wood carving, jewelry, lapidary, leatherwork, and allied craft activities.

On level five of the building are the pottery facilities, with five foot-powered potters' wheels, and four variable-speed electric wheels, plus workspace for clay preparation, clay storage, and firing.

The main shop area, which is on level two, provides space for the woodworking, machine shop, general metalwork, power and transportation, and general shop training. The space for these various activities is 140 by 120 sq. ft. with one single metal partition dividing the metal from the woodworking area, under a sawtooth roof with transluscent plastic windows facing north, so that direct light supplemented by banks of fluorescent units guarantees a minimum of fifty candlepower lighting at all times. (Powerful banks of fluorescent lights assure an equal minimum of candlepower throughout the building.) Tool cribs, one in the metal area and one in the woodworking area, allow for the efficient storage of tools at central

A view of the woodshop at William H. Danforth Industrial-Arts Building

Pottery shop at William H. Danforth Industrial-Arts Building

power and transportation facilities, spray booths, and foundry center are expelled through specially constructed flues and exhausts meeting special specifications of the Kentucky State Fire Code. Power for the machine shop consists of 120 and 220 single and three-phase voltage current, and reaches the building through conduits and two large busbars running underneath the main shop area so that all of the power equipment used in the main shop area is directly connected to the busbars, giving flexibility in the arrangement of all machines and outlets in each shop area. The conduits and ducts are *spaced* at twelve foot intervals and may be tapped at two foot intervals for outlets.

Power panels for each shop area are located in the mechanical room, but the panels for lighting are located in each individual room. Each machine in any given area has its separate switch on the main busbar and can be controlled from the central mechanical room or from the machine itself.

Sinks have been provided in all of the shop areas and water outlets are also available at convenient spots on the outside of the building.

Floor drains in such areas as ceramics and transportation contain special traps to facilitate cleaning.

Gas is also provided in all shop areas, with regulators to stop up or reduce the line pressure on gas going to various shop areas. Equipment in the industrial arts building costs approximately $175,000. Since the philosophy of the department is to provide opportunities for students to work with as many different kinds of machinery as possible, to enable them to adapt to situations they may encounter after graduation, many different manufacturers have been represented in the purchases of general purpose machinery in the building. The Pittsburgh Paint Company's color dynamics has been used as a basic color scheme for all machinery in all shop areas.

Berea's basic philosophy of industrial-arts education is that each graduate should have a strong general educational background, so that all majors are required to meet fifty-three hours of general educational requirements. In addition they must take five hours of mathematics, eight of physics, and eighteen of education, plus the forty-eight hours directly required in industrial-arts subjects. Beyond this they are also required to spend at least one year of their student labor program* as paid workers in the industrial-arts department, during which time they will perform such duties as shop maintenance, working in tool cribs, janitor work, assisting with inventory, arranging and caring for supplies and materials, doing general repairs and any other labor determined by the staff, including arranging for exhibition of student products. The variety of activities to be observed in this program brings into focus the second major point of the department's intention — to guarantee that each student will have a broad and general background of experience in the industrial arts. In connection with this aim, it is usually arranged for majors in the department to do much of their student labor in any of the college industries outside the industrial arts department which relate to special skills, as for example when a student specializing in woodworking is assigned to labor with the college furniture factory.

Berea College's philosophy almost

*All students at Berea College are required to work a minimum of ten hours a week in any of the numerous student industries, for which they are reimbursed.

Woodshop at the William H. Danforth Industrial-Arts Building

Metal shop at William H. Danforth Industrial-Arts Building

from the founding of the school in 1855 has been based on the idea that manual skills are not only honorable labor, but an intrinsic part of life, that they are intimately related to scholarship and to the full life toward which scholarship is supposed to incline. It is apparent that in the completion of the Danforth Industrial Arts Building, the institution has made a significant step forward in implementing this philosophy on its campus.

Shop Organization Simplified

LOUIS CENCI
Staten Island, N. Y.

How easily, effectively and quickly does your shop organization permit you to:

1. Check tools, equipment, and material.
2. Control use of tools, equipment, and material.
3. Control student traffic and activity in shop.
4. Spot check tools, equipment, material, and student personnel at any time without interrupting normal activity.
5. Spend less time on policing and more on teaching.

We have developed such a system and believe that with slight variations and adaptations the system can be used by most shop teachers.

In order to teach effectively the teacher must plan. The better he plans the better are his chances of success in teaching and developing good rapport. It is just as true that the more thoroughly he organizes the easier and more effective his teaching becomes. The problems in shop decrease in proportion to the thoroughness of his organization. These simple and basic rules take on even more meaning when the teacher finds himself in the teaching situation instead of in the teacher training classroom. The teacher soon discovers that there are such a myriad of activities taking place in his shop that the freedom from time consuming details, which sound practices of shop organization reward him with, make the creation of a workable system of organization a first order of business.

In order to organize these many phases of shop activity as easily and effectively as possible, many teachers try several systems or modes of approach. One major objective he should strive for in any method is simplicity. His systems of personnel management, rotation of duties, storage and distribution of material, maintenance of equipment, assignment of work stations, lockers, and the distribution of tools plus checking of all these things and many others, should all require a minimum of clerical work, easy implementation and follow-up. They should all be so simply systematized that they can be quickly explained to the students with a minimum of time and a maximum of understanding. The teacher should then be able to check up from time to time. A viable system of shop organization should permit the teacher to do many things in addition to teaching without detracting from that main function. Some of the more common nonteaching tasks follow.

1. The teacher should be able to check returned tools quickly and easily.
2. He should be able to check tools and equipment while they are in use.
3. He should be able to prevent, or keep to a minimum, the use of tools and equipment by students who did not sign out for them.
4. He should be able to control student traffic in shop by assignment to work stations.
5. He should have a constant control of tools, equipment, and material with an eye to conservation and proper use by the students responsible for them.
6. He should be able to check housekeeping of each station with a means of establishing responsibility.
7. He should be able to rotate shop duties and responsibilities among student teams so that all can benefit from them.

Of course there are many other uses and benefits of organizational practices other than the ones listed. The list includes those of key importance. The values are many. We know that our students learn by observation and that the teacher must set the example. In fact values are neither "teached nor preached," they are practiced. Students should be taught that an organized person is usually well on his way to becoming a good mechanic and a skilled craftsman. They learn organization from the way the teacher organizes and uses his shop facilities.

We have developed such a simple method in our Electrical Shop at McKee Vocational and Technical High School in Staten Island, N. Y. Our

shop organization underwent constant revision, always striving for a simpler, easier way to explain and easier to use method. Here is what we did.

1. We numbered each work station from 1 to 14. This represents the total number of work stations at the present time, although we can easily add several more.

2. We numbered each 4 ft. stepladder which we use in our work with the corresponding number of the work station.

3. Each team is assigned a number, 1 to 14.

4. Each team is then assigned to the work station of the same number.

5. Each team is then given a metal drawer approximately 6 by 6 by 16 in. which is also numbered and given to the team of that number.

6. Each team is assigned a locker which in turn is given the same number as the team, drawer, and work station.

7. A basic quantity of most frequently used material is given each team. Each piece is numbered and again all numbers correspond.

8. Basic hand tools are numbered and when distributed are given out by team number. Team six therefore receives pliers number six.

9. Student teams are listed on the progress chart by number so that rotation of shop duties can be easily followed by the class. Next to each team number are listed the names of the students.

10. The space for the drawer mentioned above is also numbered and the drawers are returned each day to this space and locked away for the night.

To illustrate how easily the system works, let us use one team as an example. Team five consists of two boys, who work at station five, use stepladder number five, keep their small materials, screws, tape, solderless connectors, etc., in drawer number five, receive and use pliers and screw drivers number five.

They are team number five and are so listed on the progress chart. When they requisition material and other equipment they sign for it and add the team number to the slip. They share locker number five and sit next to each other for attendance, etc. We do not want our boys to become mere numbers, however; therefore their names are listed, as mentioned, on the progress chart and they are encouraged to print neat wood name plates which are mounted over each of the work stations. Incidentally each student record card is numbered in the upper right hand corner.

This is how the system pays dividends to the teacher and the student.

1. If a tool is accidentally lost we can tell immediately whose was lost.

2. We can easily tell if a student "borrowed" someone else's pliers rather than walk up to the front for his own.

3. Responsibility for tools is definite.

4. There are no arguments over work stations due to changing likes or dislikes.

5. There are no arguments over stepladders. In fact better manners are displayed because they are asked for and loaned. There is co-operation.

6. Each team is responsible for a definite work area. As a result they are more careful in keeping that area clean and in good repair.

7. Breakage of material is kept to a minimum. Each team wants their material to last. They know that they will be using it tomorrow and the next day.

8. Duties such as foreman, crib attendant, housekeeping, maintenance, and safety follow numerically. Each team learns to schedule their work according to their turn at these duties. Many use slack time in the crib to improve their notebooks.

9. There is less horseplay over tools and material and more open borrowing with permission.

10. Daily checkup of the shop is greatly facilitated. The teacher can check quickly and easily, and hold responsible, the team involved in any mix-up.

11. The shop just about runs itself. Students concentrate on their work, not on where to work, with what, whom, and whose tools, or with what kind of material.

A few explanations are in order. Each team, at the time they receive their material for the drawer, signs a receipt form, on which is listed the material. When the unit of work comes to an end, the material they return is checked off against the list. Of course the teacher must make reasonable allowances for normal wear and breakage. It has been our experience however, that more material is usually returned than is distributed. The boys often bring in small

A view of the numbered work stations

quantities of material to add to their supply or to use the latest device. They have usually donated the material to the shop, completely on their own. This has in turn proved to be strong and healthy motivation for succeeding classes. Each drawer is stored, locked and only the class and team to which they were issued, use them. The other lockers referred to are steel cubicles, 12 by 12 by 16 in. deep. Aprons, code books, personal tools, and other small articles are stored here. Other schoolbooks may not be stored here and students are warned against leaving books in school over night.

Our system is working well. In the two years it has been in effect we have not lost a single tool. There have been no accidents and we have had time to paint up and build many teaching aids. We are thinking of doing some other things in keeping with continuous numbering. We are contemplating numbering every two adjoining armchairs alike, two number ones, two number twos and so on. Another thing is to stencil shop aprons with team numbers. We use a safety booklet made up by the electrical department from the official safety manual of the New York City Board of Education. Each boy studies the booklet and takes the safety tests in it. We are going to have each student add his team number to the book, term by term. This will give us an easy record of which students worked together as the book travels with the student to each teacher.

We feel that our system has other important benefits. We believe that the teacher should remove as many details as possible so the learner can concentrate on learning the trade material. The simplicity of our system does this. At the same time we want our youngsters to become organized in their thinking and in their work. We want them to learn to plan and lay out work. By learning our system and following it, we believe our youngsters are learning the values we want them to. There has been a definite improvement in class pride and an increase in morale. Youngsters find direction in an orderly system. They will usually do what we want of them if they understand and can easily do it.

Teachers benefit also. They have more time for the primary job of teaching which is to teach. At the same time they are teaching much which does not appear in the plan of teaching. We can give more individual help to the boys. They in turn contribute to the shop in better conduct, faster work, better work and extra projects. They practice cooperation, neatness, conservation, responsibility, pride and good practices of organization. Cash in on these many benefits, try a simplified system of shop organization.

The Open Tool Panel

JOHN T. DeNUNZIO
Middletown High School
Industrial-Arts Department
Middletown, Conn.

The ideal industrial-arts shop is, in essence, one large visual teaching instrument. Nowhere is the use of visual material more in evidence than in the shop. In the construction of a project, regardless of the medium, whether it be woodworking, metalworking, plastics, drafting or electricity, the student has before him visual materials.

From the outset he has at hand a photograph (black and white or colored), a freehand drawing or other illustration, and often even a finished, actual example of a project, the construction of which he may be contemplating. Once he has selected his task, visual materials are again available to facilitate his work.

He begins with a sketch, a diagram,

Tools visible and accessible

A place for everything, and everything in its place

or a blueprint, to show him effectively the various parts, views, and dimensions which will make up the completed project. The next logical step would be the identification of the proper tools for the job at hand. This brings the student to the heart of the shop — the open tool panel — the largest and most effective single visual material in the industrial arts laboratory.

Shops which have been installed in the public high schools in the past ten years have featured a visual display of tools to be used in everyday learning experiences in the shop. Prior to World War II many of the school shops kept tools in locked closets or tool cribs. Visual contact with these important instructional tools was kept at a minimum. This, of course, could not help but limit learning to brief periods only, when the student might actually be using a particular tool. In direct contrast to the tool-crib sign-out system of obtaining tools for use in class, the present-day industrial-arts instructor advocates the use of the open tool panel.

The open tool panel can be one of the most powerful visual materials and thereby one of the most useful and effective teaching aids in the shop. If the tool panel is attractive and appealing to the eye, it will be one of the focal points of the student's attention while he is in the shop. *The tool panel is important in achieving some basic objectives in the teaching of industrial arts.* One of the objectives of a course in industrial arts is to instill in the student esthetic appreciation — a sense of good design. In the construction of a tool panel, in the selection of color, attention to texture and in the attractive as well as functional arrangement of tools, much can be done toward the fulfillment of this aim.

A second important objective of industrial arts is to teach the identification, the care, and the use of hand tools. The tool panel is of prime importance in the achievement of this objective. For purposes of ease of identification of tools and for indication of their use, tools are arranged according to family. For example, the family of wood area measuring tools — cabinet square, try square, level, marking gauge, sliding T bevel, zigzag ruler, compass, and others make up one section of the panel. This makes them easily recognizable as to use. Again, other tool families are grouped, and designated, each to a specific area on the panel. Thus the boring tools are placed together and so also the cutting tools, the joinery tools, the hammering family, and so on down through the metal area tool families.

Instructing students in the use of tools directly from the toolboard

This carefully organized arrangement of the many and diversified hand tools in the entire shop minimizes loss and encourages the proper care of tools.

Closely connected with the last mentioned objective in the teaching of industrial arts is a third aim — that of teaching orderliness and safety. The tool panel is the exemplification of "a place for everything and everything in its place."

Industrial arts attempts also to provide consumer information to the student. The tool panel, with tools always visible and always within reach, gives a fine background for the wise selection of tools for the home workshop.

Though emphasis has been placed on the open tool panel as the most effective *single* visual material in the shop, after the selection of proper tools for construction of a project other varied and valuable visual materials are ever present. Among these are timely demonstrations by the instructor of various techniques and skills, movies, slide films, picture series, color charts, stain swatches, wood and metal samples, samples of graded sandpaper, steel wool and other finishing materials. There are innumerable visual materials available to the alert instructor and the modern industrial-arts shop is thereby made a more interesting center of integrated and purposeful learning student activity.

Continuous Observational Testing

ROLAND BACON
George Washington High School
Danville, Va.

Most of the tests used in conjunction with courses of study in industrial arts and other subject areas are designed to test for specific knowledge or skills. This testing is usually done at predetermined periods, intervals, or as a part of the school's regular testing program. Testing for knowledge and skills is important, but is only one aspect of the objectives of general education.

Other desirable generalized controls of conduct are expected to develop as the result of industrial-arts experiences, especially at the upper elementary and junior high school level. Another means of evaluation should be used rather than the tests for knowledge and skills which we ordinarily use as they do not give a complete picture of an individual's growth and development. Provisions should be made for evaluating individual progress.

Since the learning process is continuous, evaluation should also be continuous and not reserved for specific intervals. The reserving of evaluation for a specific time defeats the purpose of instruction. This applies both to the pupil's evaluation of the results of his activities and the teacher's evaluation of the results of instruction.

Observational tests fill the need for such a day to day evaluation of these generalized behavior changes. More can be told about the all-round development of a pupil by observing him every day than by any other method. This evaluation should be concerned with the progress of pupils in accordance with the accepted aims of education.

A check list might be devised by the teacher of industrial arts to evaluate educational outcomes such as the following:

1. *Self-Reliance.* Does the pupil depend largely upon himself for the solution to his problems or does he continually seek the help of others or try to get them to do his work?
2. *Accuracy.* Does he strive for accurate measurements and construction or is he satisfied with inaccurate work?
3. *Discrimination.* Does he notice the difference in well-designed and well-constructed articles in contrast to articles of *shoddy* or inferior construction?
4. *Satisfaction.* Does he derive satisfaction from doing a good piece of work or accomplishing something worthwhile?
5. *Interest.* Does he go directly to his work or project without dawdling or wasting time? Does he come up with new ideas and express them?
6. *Application.* Does he apply the basic principles and skills which have been taught him in new situations or does he have to be taught all over again?
7. *Analysis.* Can he analyze what he has done and convey the information to others?
8. *Neatness.* Does he maintain a neat working area or is everything cluttered up? Are the tangible results of his work neat?
9. *Co-operation.* Does he co-operate with other members of the group and with the instructor? Does he make a contribution to group activities?

These are some of the observations that a teacher in the field of industrial arts can make from day to day. They tell much more in the way of growth and development and general conduct than periodic testing of knowledge and skills.

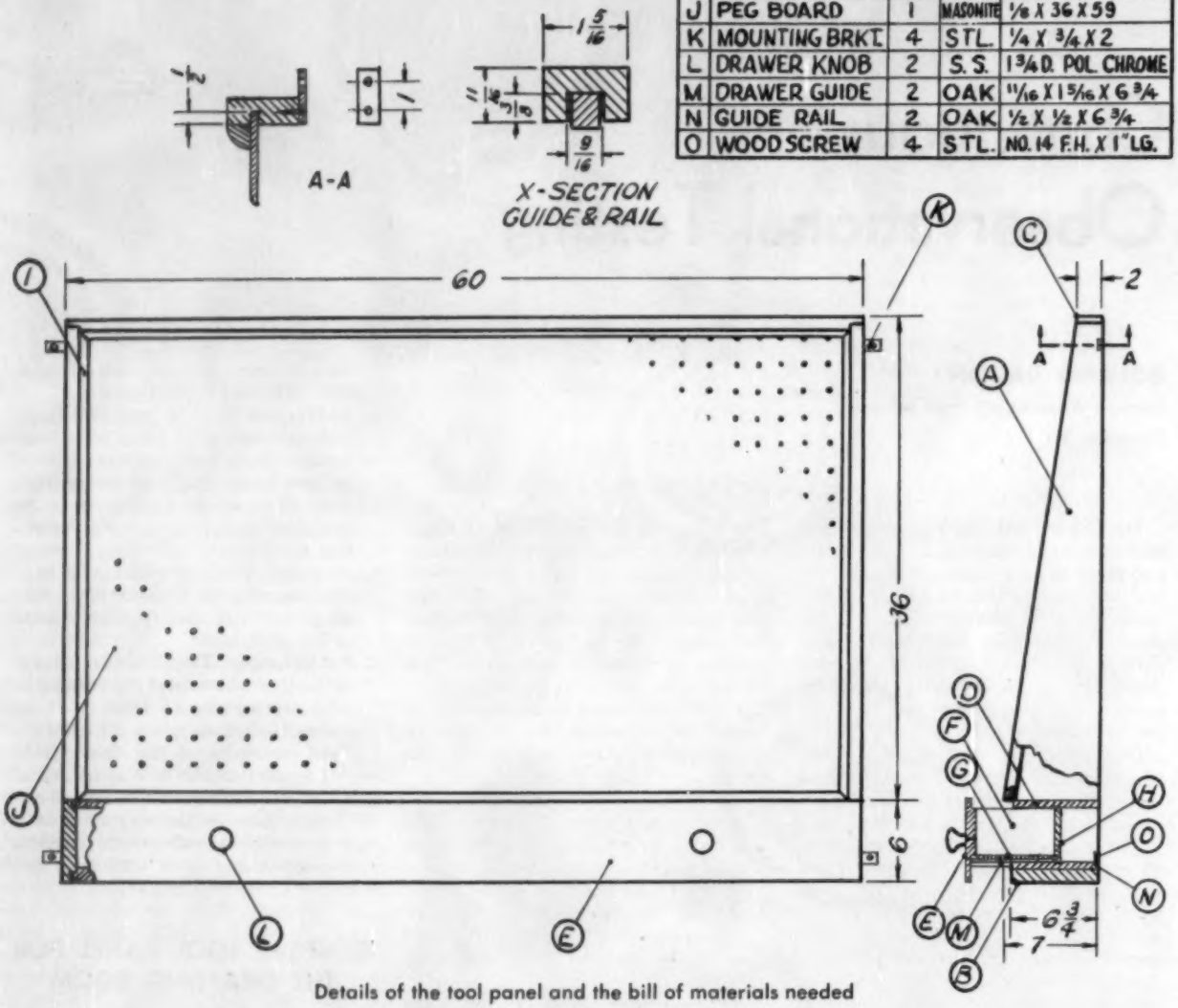
GENERAL TOOL PANEL FOR THE DRAFTING ROOM

THOMAS J. MINTER
Assistant Professor
Engineering Drawing and Design
Tri-State College
Angola, Ind.

The general tool panel in the drafting room is used for holding and storing various instruments, devices, and materials which are not assigned to stu-

TOOL PANEL FOR DRAFTING ROOM

BILL OF MATERIALS				
PC.	NAME	QUAN.	MATL.	SIZE
A	SIDE	2	OAK	1 X 7 X 42
B	BOTTOM	1	PINE	1 X 7 X 59
C	TOP	1	OAK	1 X 2 X 60
D	DIVIDER	1	PINE	½ X 6 ¾ X 59
E	DRAWER FRONT	1	OAK	¾ X 6 X 60
F	DRAWER SIDE	2	PINE	½ X 4 X 6 ½
G	DRAWER BOTTOM	1	PLYWOOD	¼ X 6 ½ X 57 ½
H	DRAWER BACK	1	PINE	½ X 4 X 57 ¾
I	TRIM	1	OAK	¾ RD. X 15'-8"
J	PEG BOARD	1	MASONITE	⅛ X 36 X 59
K	MOUNTING BRKT.	4	STL.	¼ X ¾ X 2
L	DRAWER KNOB	2	S.S.	1 ¾ D. POL. CHROME
M	DRAWER GUIDE	2	OAK	11/16 X 1 5/16 X 6 ¾
N	GUIDE RAIL	2	OAK	½ X ½ X 6 ¾
O	WOOD SCREW	4	STL.	NO. 14 F.H. X 1" LG.



Details of the tool panel and the bill of materials needed

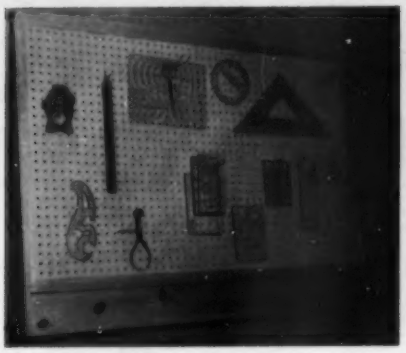
dents individually, because of the infrequence of use and the cost involved.

The tool panel depicted herein consists of a panel board and a drawer. The panel board is designed and constructed at a slight slope to the rear so that tools will lie flat against it and not dangle about. It may be used for holding templates, special curves, protractors, scissors, lettering guides, scales, and various other general tools found in the drafting room. The drawer can adequately accommodate drawing ink, lettering pens, tracing powder, planimeters, mechanical lettering devices, beam compasses, and so on.

If so desired, the panel board can be made of plywood rather than masonite peg board, so that silhouettes of the different tools could be painted on it along with permanent tool hangers so as to facilitate checking. Also, a flush type lock may be installed in the drawer, if wanted.

The finish of the general tool panel should be both durable and pleasing. It is suggested that the panel frame

and the drawer front be coated with a durable cabinet varnish, and that the panel board be finished with a flat paint of some suitable color.



Tool panel in use

The main advantages of this type of tool panel are: (1) the ease in checking on the many unassigned tools; (2) the interest created in the different tools by an open display; and (3) the relatively small floor area that it occupies.

A USEFUL TECHNIQUE FOR TEACHING TOOL TERMINOLOGY AND IDENTIFICATION

L. V. PATTERSON

Assistant Professor, Department of Industrial Education

A. and M. College of Texas

College Station, Tex.

A definite problem in school shops is the difficult task of clarifying and emphasizing the need for the student to acquire a knowledge of the terminology used. Details such as proper spelling and correct identification are two prominent examples.

With more and more things to include, and with only a minimum of time available, any successful technique that will remove the necessity of organizing extra units, lectures, or instruction sheets will materially ease the teaching load. One such method, used with success over a period of several years, was the practice of labeling all tools and equipment in the tool room, on tool panels, and in tool cabinets.

While the author was at Pekin, Ill., Community High School, it became obvious that time available for certain elements of instruction was more than ever at a premium. Exploratory courses, in particular, required that most related information be carefully screened and apportioned.

To overcome the need for a particular emphasis on tool identification, spelling, and the proper terminology involved, the tool panels were labeled, at each silhouette, with the name of the tool.

Experience with this technique bore fruit immediately. Such commonly misspelled words as: trammel points, auger bits, and others were only occasionally incorrect; and proper identification of "compass" saws, rather than "keyhole" saws became more or less routine. Further experience indicated that, at least for beginning groups, possibly machine tools also needed proper identification.

There are several means available for doing such labeling:

1. A sign painters' brush, if expertly used, will do very well.
2. Stencils.
3. Prepared signs, of attractive nature.

At present there are some possible sources for prepared materials. These include:

W. H. Brady Co., 727 W. Glendale, Milwaukee 9, Wis. Westline Products Division, Weston Lithograph Co., 600 E. Second Street, Terminal Annex, Los Angeles 54, Calif.

A PROVED METHOD OF TEACHING BLUEPRINT READING

ARNOT P. McINTEE

Shop Director

Collegiate Institute and Vocational School

St. Catharines, Ontario, Canada

In this highly industrialized age of automation that demands an ever increasing knowledge of machine technology, electronics, and hydraulics the age-old art of blueprint reading is an indispensable tool of the twentieth-century tradesman. For if specialized equipment is to be built, then the complex drawings of this modern era must first be interpreted.

As a drafting teacher, I have attempted to teach blueprint reading allied to my drafting course, but as a separate subject. So that the students do not lose too much classroom drawing time, I have chosen to do as much blueprint reading as possible by means of weekly homework assignments. Each week one of my drafting periods is set aside to teach this related subject. During this time answers to the previous week's assignment are given and any problems or questions the students might have are discussed. Following this, the information relative to the next problem is discussed, and the problem issued for homework for the following week.

When I first began using this homework method, it was very obvious that many students were copying the work of one or two in their group. As a result the homework feature of blueprint reading seemed bound for failure.

To overcome this weakness, I have photographed all my blueprints, using 35mm. Kodakchrome film. With these photographs mounted in 2 by 2 in. glass slides, I am now able to project my prints on a 60-in. glass bead screen with amazing clearness. When the slides were made, I announced to my classes that I was giving each member one hundred free marks. I will long remember the ovation that I received. When all was quiet I informed them that if they wished to keep their one hundred marks all they had to do was to explain to the class and myself how they arrived at the answers to one or two questions on the homework assignment they had completed during the past week. Of course, as they all did their homework, this would certainly not present any difficulty. If they answered their questions correctly they kept their one hundred marks. If, however, they were unable to answer, then ten marks would be deducted for each unanswered question.

The results of my method have clearly proved that those who regularly complete their work receive good marks, and those who formerly copied are now doing their own assignments and doing well.

In addition to this teaching method, I have also prepared a set of blueprints and question sheets identical in every detail to those used each week by the students. Every few weeks, without previous warning, I administer one of these prints as a blueprint reading test. As the class completed it for homework a short time ago, I feel that they have a good knowledge of the print and I think I am justified in reducing the allotted time on the test from that required by them on their first attempt. As these test marks are recorded and used for term marks the students now have two good reasons for doing their homework on their own, and making certain they understand all phases of the print concerned.

Since using this method I now feel that the study habit is being formed and that the principles of blueprint reading are being well learned.

The U. S. Army has an investment of more than $24 billion in real estate and facilities in every state of the union and abroad, and carries an inventory of material of about $21 billion — approaching in size the combined inventory held by all the country's manufacturers. — *Wisconsin Military District Information Office.*

A Basic Vocabulary and Glossary in Machine Tools and Job Machine Shops

ERNST H. SUERKEN
Supervising Principal
Union Free School District
Greenburgh No. 11
Dobbs Ferry, N. Y.

A

abrasive
accuracy
air-operated chuck
apron, lathe
Arnold gauge
assembly line
atom
automatic screw machines
  single spindle
  multiple spindle
automatic type transfer machine
automobile engine

B

back gears, lathe
ball crank
bar turner
bar turning machine
basic machine tool operation
bending die
bending machine
"blank" sheet metal
blanking die
boring bar, turret lathe
boring, drilling, and milling machine
boring mill, vertical
"Bort" diamonds
bow drill
box turning tool, turret lathe
broaching machine
buffing operation
"built-up edge"
"bull gear"
buzz saw

C

cam action
cams, drum
"carbon" drills
carborundum
corundum
calipers
calipers, hemaphrodite
calipers, micrometer
carriage, lathe
castings, die
castings, metal
chaser (die head)
chuck, three and four jaw
chuck, collet
chuck, pneumatic
chuck jaws, hard
chuck jaws, soft
chucking machine, multiple spindle
circular form tool
"climb" milling
collapsing tap
combination square
compound die
compound rest
conehead lathe
core drilling
cranes and hoists
crank-slotted rocker arm
crank motion for press
cross slide, lathe
counterboring tools
cupping of sheet metal
cutoff tool, lathe

D

depth micrometer
dial indicators
diamond wheel dresser
die castings
die-head, self-opening
die-set, press
dies, sheet metal
dividers
dividing head, Universal
dog, lathe
double-action die
double-action press
dovetail form tool
drilling
drill press, heavy duty
drum cams
dynamometer

E

eccentric mechanism
electric gauges
electric hoists
electric truck
electroplating
embossing (sheet metal)
emery wheels
engine lathe

F

face milling cutters
faceplate lathe
feed rod, lathe
feed screw, lathe
finish on metals
fits of mating parts
fixtures, milling machine
flash welding
flow process charts
flywheel
follow die for sheet metal
follow rest, lathe
forge shop
forging process
form relieved milling cutters
form tools, lathe
foundry

G

gang milling
gang planing
gear cutting machines
gear hobbers
gear shaper
geared headstock, lathe
"Go" and "Not Go" gauge
grinder operation
grinding machine
  centerless
  cylindrical
  disc

floor stand
internal
planetary type
grinding wheels
grindstone

H

"Half Nuts" in lathe apron
handwheel
headstock, geared lathe
heat-treating operations
helix
hemaphrodite caliper
hexagon turret
high speed steel
Hobbing machines, gear
hydraulic planer drive
hydraulic press

I

index centers, milling machine
index head
industrial truck
interchangeable parts
ironing operations

J

jigs, drill
jigs and fixtures
Johannsson gauge blocks

L

lapping machine
lathe, apron
lathe, carriage
lathe, conehead
lathe, dog
lathe follow rest
lathe sizes
lathe steadyrest
lathe tool
lathe, turret
lathe, woodworking
lattice
layout instruments
lead
lead angle
leadscrew, lathe

M

meter, standard
micrometer caliper
milling cutters
angle
disk type, for gears
form
inserted tooth
plain or helical
shell end
side
straddle
milling machines
dial type
fixed-bed type
knee and column
manufacturing
"Mock-ups"
multiple-spindle drills
multiple turning head, turret lathe
planer type
profile
universal
vertical

N

"Necking"
new machine tool

O

optical comparator

P

"Permanent set" of metals
peripheral speed
drilling
lathe
milling
planer drives
planer, elements of
plate cams
plug gauge
pneumatic die cushions
power feeds
drilling machine
lathe
milling machine
shaper
power press
precision gauge blocks
press brakes
press, hydraulic
press motions
presses, punch
profile
progressive die
punching die
punch press

Q

quick change gear box, lathe

R

rack drive, planer
rack and pinion motion
radial drill
"Rake angle"
ram type turret lathe
ratchet and pawl mechanism
reamer, "Rose"
reamer, shell
ring gauge
riveting

S

saddle type turret lathe
screw threads
selective fits
sellers planer drive
semi-automatic lathes
shaper
shaper, gear
shearing
shell and mill
slab milling
slotter
snap gauges
special purpose machines
specialty machine operator
spiral end mill
"Spotting" scribed hole
squaring shear
stamping plant
"Star" wheel dresses
Steadyrest, lathe
Steam hammer
steel, tensile testing
stopwatch
straddle milling cutters
subassemblies, principle of
superfinishing
surface broaching
surface gauge

T

tailstock
tap, collapsing
taps and tapping
"Therbligs"
threading
toggle action
tolerance
tool "crib"
tool design
tool and die maker
tool engineering
tool making
tote boxes
trimming
turret lathe
ram type
saddle type
vertical
turret, hexagon
turret, square
twist drill
clearance
feed
peripheral speed

V

V belt
Vernier scale on micrometer
vertical shaper
vertical turret lathe
vise, drill
vise, milling machine
visual type comparator gauge

W

welding, arc
welding, flash
welding, spot
work-hardening of metals

Y

yard, standard

Glossary

A

ABRASIVE WHEEL: A grinding wheel of hard, abrasive substance. Wheels are made in a variety of shapes, textures, and sizes.

ADAPTER: Any fitting used to fasten milling cutters to the machine spindle.

ARBOR: A hardened, ground, slightly tapered bar used to support bored parts while they are machined or to support and rotate the cutting tools.

B

BAR CUTTERS OR TOOLS: Cutting tools which are forged and ground from bars of tool steel, used to cut and shape metal in such machines as engine lathes, shapers and boring mills.

BAR TOOLS: See bar cutters.

BEAD: A narrow plait or boss that is produced along a weld seam by the depositing of metal from the filler rod. As the bead is fused with the parts, it becomes an integral part of them.

BELT DRESSING: An adhesive and softening material applied to leather belts to increase the friction between belt and pulley surfaces.

BUFFING LATHE: A machine equipped with interchangeable polishing and buffing wheels of various kinds, used to smooth and polish the surfaces of metal parts.

BURNING EQUIPMENT (oxyacetylene): *See* welding equipment.

C

CALIPER (Inside or Outside): A measuring instrument consisting of two legs which are joined by a hinge or pin. The legs can be separated at their free ends and adjusted to span the dimensions to be measured. The legs of the inside type are straight with the top of the free ends turning outward, while those of the outside type are bowed.

CARBONIZING BOXES: Metal containers in which the parts and carbonizing compound are packed to case-harden steel parts.

CARBONIZING COMPOUND: A carbonaceous or carbon-bearing material, such as charred leather, powdered bone, cyanide of potassium or sodium, and charcoal, used as the sources of carbon in the process of case-hardening steel.

CASE-HARDENING: The process of hardening the surface of mild steel by impregnating it with carbon, thus producing an outer shell of steel with a higher carbon content and increased hardness.

CENTER PUNCH: A pointed hand tool shaped like a pencil, used for making small indentations in metal to locate reference points or centers for holes.

CHAIN HOISTS: A system of chains and pulleys, operated by hand and used for lifting heavy objects.

CHUCK: An adjustable, multiple-jawed fixture, designed to hold and rotate tools or stock in position during machine operations.

COLLET CHUCK: A vise-like device for holding round material of one diameter. Each diameter of cylindrical stock requires the use of a collet that size.

COMPASS: An adjustable, two-legged instrument for describing circles and marking off dimensions in laying out work.

COOLING FLUID: A liquid such as lard oil, with which the cutting tools of metal working machines are cooled and lubricated.

COUNTERBORE: To enlarge the top of a drilled hole so that the sides of the main and the enlarged portions of the hole are concentric and the plane in which they meet forms a square shoulder.

COUNTERSINK: To produce a flaring conical opening at the top of a drilled hole for the seating of a conical-shaped head of a screw, bolt, or rivet below the surface.

CUTTING TOOL: A sharpened, hardened piece of tool steel used in powered machines to cut metal.

D

DIE HEAD: A cylindrically shaped fixture or chuck, to which the die holders are attached. The die head rotates the dies around the part and receives the motion from a spindle to which it is affixed.

DIE HOLDER: The clamping fixture that is attached to the die head and in which the threading dies are set.

DIES (Threading): Rack-like cutters whose teeth cut and shape grooves in the stock to form threads. They are usually used in sets of four, placed symmetrically around the circumference of the stock.

DIVIDER: An instrument consisting of two legs which are pointed at one end and joined by a hinge or pin at the other. It is used to mark off measured distances in mechanical drawing or layout work.

DOGS: Clamps that are fastened to the work to transmit rotary motion from the faceplate to the work.

DRILL: A pointed, spirally fluted cutting tool which is clamped in a drilling machine or hand tool and rotated to drill holes in materials such as metal, wood, and bakelite.

DRILL PRESS: An upright, metal working machine for drilling holes in metal. The drill is forced into the work by hand or automatic feed.

E

ELECTRIC HAND DRILL: A portable electric motor equipped with a chuck for the mounting of drills, used for drilling small holes in work.

ELECTRODE (Filler Rod): The metal rod that supplies the metal added. It is held in an insulated holder and the heat from the electric arc formed between the part and the rod melts the end of the rod.

ENGINE LATHE: A power driven, metalworking machine for turning stock to circular cross section. The stock is supported and rotated on a horizontal axis and formed to size and shape by the shaving action of a cutting tool, clamped in a holder, being fed against the surface.

F

FINGER: A small pedestal or arm that engages the teeth of a cutter and holds each succeeding tooth as it is ground in the same position.

FIXTURE: *See* jigs and fixtures.

FLUX: A chemical compound (usually a powder) that promotes the fusion of the metals during welding or soldering.

G

GAUGE: A term applied to any of various measuring devices, such as calipers, micrometers, and machinists' scales.

GEAR BLANK: A piece of material from which a gear is to be machined.

GRINDING HEAD: A machine part that supports and rotates the spindle on which the grinding wheel is mounted.

GRINDING WHEEL: A power-driven abrasive wheel, sometimes water cooled, against which tools are held to sharpen them.

H

HAND-TYPE SHIELD: A metal protector, fitted with a glass window, which is held in front of the eyes and face during welding for protection against sparks and arc rays.

HARDENING: The process of increasing the hardness of steel by heating it to a relatively high temperature and quickly cooling it by quenching in a bath of oil, water, or brine.

HARDENING FURNACE: A refractory lined oven, heated by electricity, gas, oil, coke, or coal, in which steel parts are heated during the process of heat treating.

HARDNESS TESTER: A device for determining the relative hardness of steel parts. Usually only one type (Brinnell, Rockwell, or Scelerscope) will be found in any particular plant.

HEADSTOCK: That part of a machine which supports and rotates the work during machining operations.

HOB: A threaded, grooved metal cutter for forming threads or metal.

HOOD-TYPE SHIELD: A protector, fitted with a glass window, which is worn over the head of the worker during welding for protection against sparks and arc rays.

HORIZONTAL BORING AND MILLING MACHINE: A metalworking machine designed to perform several machining

operations on large work. The rotating horizontal spindle may hold tools for milling, drilling, boring or grinding.

HORIZONTAL TURRET LATHE: A power-driven metal working machine in which the stock is held and rotated about a horizontal axis while it is machined by a number of cutting tools. The tools are fixed in a holder, so mounted that one or more may in time be brought into action for machining operations.

I

INDEXING HEAD: A precision device for spacing cuts around the periphery of metal pieces.

INTERNAL GRINDING MACHINE: A power-driven machine for grinding the internal surfaces of openings in metal parts to a smooth finish and accurate circular cross section by the action of a rapidly rotating abrasive wheel.

INTERNAL KEYSEATING MACHINE: A metalworking machine for cutting slots (keyseats) in machine parts such as gears and wheels. These parts are locked onto similarly slotted shafts with metal strips called keys.

INVENTORY: A periodic record of stock.

J

JAW CHUCK: A grasping device with two or more vise-like jaws. Each jaw may be moved independently to adjust the position of the work supported, or, in integral chucks, all jaws may be moved simultaneously to grasp the stock.

JIG (*See* Jigs and Fixtures): Frequently the terms jigs and fixtures are used interchangeably. However, a jig is commonly defined as a device that holds the work and guides the tool during the cutting operation. A fixture, on the other hand, consists principally of a clamping device for holding the work while it is being machined, but with no provision for guiding the tool to the work.

M

MACHINIST'S OR MECHANIC'S SCALE: An accurately graduated steel rule.

MANDREL: A hardened tapered metal shaft which is pressed through the holes of a part to support the part in a lathe while it is faced or turned.

METAL BAND SAW: A power-driven saw used to cut metal. The blade, an endless steel band toothed on one edge, runs over the rims of two wheels mounted one above the other. The descending side of the blade passes through a slot in a table mounted between the wheels.

METAL CIRCULAR SAWS: A power-driven toothed disk of thin steel designed to cut metal. The work is supported on a table and engaged with the saw teeth by the movement of either the saw or the table.

MICROMETER: An accurate, screw-adjusted measuring device, from the engraved scale of which dimensions can be read to small fractions of an inch.

MICROMETER CALIPER: *See* micrometer.

MILLING CUTTERS: Multiple-toothed or fluted disks or cylinders of hardened tool steel designed to cut metal as they rotate in contact with it.

MILLING MACHINE: A metalworking machine in which the surface of work is shaped and dressed by the shaving action of rapidly rotating cutting tools against which it is fed.

MULTIPLE-SPINDLE DRILL PRESS: An upright metal-drilling machine equipped with several drilling spindles by which a number of holes can be drilled simultaneously or in sequence in the work.

O

OUTSIDE CALIPER: *See* caliper.

OVERARM PENDANT: An adjustable support for the end of a cutter arbor farthest from a milling machine spindle.

P

PITCH: The distance between the center of one thread and the center of the next thread.

PLANER: A power-driven metalworking machine used for reducing stock to required thickness or producing a flat smooth surface. The stock clamped to a table, is reciprocated against a stationary cutting tool, thus shaving metal from the surface.

POT FURNACE: A metal or carbon kettle, heated by electricity, gas or oil, which is used to heat baths for heating, quenching, and hardening steel.

POWER HACKSAW: A metalworking machine in which the stock, clamped in position, is cut to length by a reciprocating saw blade.

PRESS: A power mechanism used to force parts together in assembling work.

PROTRACTOR: A device for measuring and laying out angles.

Q

QUENCHING OILS: Oils such as fish oil, linseed oil, cotton-seed oil, and specially compounded oils.

QUENCHING TANK: A cylindrical metal tank which contains oil, water, or brine. The quenching liquid may be circulated through a cooling system by pumps if a cold quench is required.

R

RADIAL DRILL PRESS: A power-driven metalworking machine for drilling holes, the drill head being so supported that it may be moved over a large area to drill holes in objects of large size.

REAM: To enlarge a drilled hole and produce a smooth inside surface by the removal of a comparatively small amount of material.

REAMER: A grooved (fluted) tool used to enlarge drilled holes.

S

SCRIBER: A sharp-pointed, pencil-like instrument, used to scratch marks on metal.

SHAPER (Horizontal or Vertical): A power-driven machine for shaping the surface of metal. A reciprocating ram carries a cutting tool across the surface of the work, which is clamped in a vise on the adjustable table of the machine. The tool reciprocates either horizontally or vertically according to the type of the machine.

SPOT-FACE: To produce a smooth, flat surface around the top of a hole for the level seating of a nut on the head of a screw or bolt.

SQUARE: An L or Z-shaped steel instrument for determining right angles.

SURFACE GAUGE: A device for marking metal parts with lines at precise distances above a plane surface. It consists of a flat-surfaced metal block that will rest evenly on the plane surface and a pointed, pencil-like rod of hardened steel mounted adjustably on the block.

SURFACE GRINDER: A metalworking machine on which the plane surfaces of work are accurately shaped and smoothly finished by the abrasive action of a rapidly rotating grinding wheel.

T

TAILSTOCK: That part of a machine which, with the headstock, supports the work during machining operations.

TAP: A tool used for producing a screw thread in a drilled hole.

TAP: A tool used for forming an internal screw thread, as in a nut. It consists of a hardened tool-steel screw grooved longitudinally so as to have cutting edges.

TAPPING MACHINE: A metalworking machine for forming a screw thread in a drilled hole by the cutting action of a rotating tool (tap) with appropriately shaped cutting edges.

TEMPERING: The process of heating a steel part, which has been hardened, to a temperature below its critical temperature, maintaining that temperature for a specified length of time, and allowing it to cool. By choosing suitable temperatures and maintaining them for suitable periods

of time, the hardness and toughness of the object may be varied through a wide range. This term includes both the hardening and the drawing of hardness (tempering as defined above) in the heat treatment of tool steels.

TEMPERING FURNACE: Similar to the hardening furnace except that it is not usually constructed to produce such high temperatures.

TEMPLATE: A pattern, guide, or model used to indicate the shape to which an object is to be machined.

TRUING TOOL: A tool, studded with diamond chips, used to dress the cutting surface of an abrasive wheel. It is usually mounted on the grinding machine.

TWIST DRILL: A special type drill for cutting metal.

U

UNIVERSAL GRINDER: A metalworking machine for accurately grinding stock to shapes of circular cross section. The stock is supported and rotated on a horizontal axis and is ground by the action of a rapidly rotating abrasive wheel pressed against the surface. The machine is designed for external, internal, and tapered grinding of stock.

V

VERTICAL BORING MILL: A metalworking machine for cutting large work to shapes of circular cross section. The work is supported and rotated on a turntable and is machined by stationary cutting tools being fed against the surface.

VERTICAL TURRET LATHE: A metalworking machine in which large work is supported and rotated on a turntable while it is machined by a number of cutting tools. The tools are fixed in a holder so mounted that one or more may in time be brought into action for machining operations. This lathe is designed to handle larger work than the horizontal turret lathe.

VISE: A fixture for holding work by pressure between a stationary jaw and a screw-adjusted movable jaw.

W

WELDING EQUIPMENT (Oxyacetylene): Two regulators that measure and control the pressure and flow of gases from tanks; a hand torch that mixes the gases (oxygen and acetylene) before ignition at the torch tip, two hoses to convey gas from the regulators to the torch; a number of torch tips with a variety of orifice sizes.

WELDING ROD: The metal rod that is melted into a weld. In electric welding the rod serves and is referred to as an electrode. In oxyacetylene it serves only to fill the weld and is termed "filler rod."

WELDING MACHINE: A motor-generator set, mounted on a frame which supplies the power for electric welding.

The Guided Professional Tour

HILTON L. THOMPSON
Industrial Arts Instructor
Brinkley Junior High School
Jackson, Miss.

It is a growing trend for industrialists, businessmen, educators, and others to interpret their programs to each other in the light of aims, objectives, methods of training, methods of production, requirements, standards. The guided tour is one approach whereby one may get to know the organic structure, to some degree, of an industry, business or some other type of establishment.

This type of tour in and of itself may be considered as a visit or journey through a particular place in the interest of observing, gaining professional, industrial, or commercial information; it is usually guided by a responsible adult and should have educative value.

To be sure, this can be a wholesome opportunity for pupils to correlate their classroom and shopwork with various concerns. For example, a class in woodworking has possibilities of learning a great deal from visiting a furniture factory. Moreover, a class in journalism may gain invaluable information by visiting a newspaper press.

These situations have possibilities which make for greater appreciation and understanding in a changing and a complex society. Students have the privilege of becoming acquainted with various forms of automation, the nature of many types of work, the innovations taking place, working conditions, and so on.

The following factors should be taken into consideration in connection with tours:

1. The officials or representatives of the places to be visited should be contacted by letter, telephone, or a personal visit.
2. Detailed arrangements should be made with regard to the time and the number of students who are going on the tour and the sponsor of the tour should have his group at the establishment at the appointed time.
3. On elementary, junior high school, and senior high school levels the sanction and the approval should be got from the principal, superintendent, or some other school official who has duly constituted authority.
4. It is well that the students get the consent of their parents or guardians; this may be done in several ways.
5. The pupils should be informed adequately about the nature of the tour, some of the possible factors to look for, and the educational value.
6. If possible, the same mode of transportation should be used by all students in order to help alleviate problems which may come about. This can be varied on a college level, however.
7. After having returned from the tour discussions may be held on various phases in addition to that of administering a test, if the instructor sees fit to do so.
8. Information should be given with respect to not interfering with the workers, tampering with machines, gadgets, supplies, departing from their groups, if they are divided.
9. The students should be encouraged to ask questions, if it is permissible.
10. In many instances units may be studied concerning various phases of work and integrated with information received from tours or visits.
11. Letters of appreciation should be sent to the places toured.

At the new Fuhrmann Jr. High School in Warren, Mich.—plans of which were exhibited by AASA—John I. Clifton, Chairman of the Audio-Visual Coordinator's Committee for the Warren Consolidated Schools, says:

"Convenience frees teachers to teach... we like it in the design of our school... we like it in Kodak Pageant Projectors."

"All teachers like the kind of convenience that frees them to *concentrate* on teaching. That's one reason our major activity areas are centrally located in our new school near the administrative office. And the same kind of reasoning led us to select the Kodak Pageant Projector—so *easy* to use that students take care of most of our movie showings."

Would modern, easy-to-use equipment help strengthen your audio-visual program? The Kodak Pageant 16mm Sound Projector gives you folding reel arms and attached drive belts—a truly easy machine to set up. You have a projector *anyone* can operate with ease. Ask your Kodak Audio-Visual Dealer to demonstrate. Or get full details by writing for Bulletin V3-22.

Kodak Pageant Projector **EASTMAN KODAK COMPANY, Dept. 8-V, Rochester 4, N. Y.**

(For more information from advertisers, use the postcard on page 91A)

KESTER SOLDER

all-round practical teaching aid!

KESTER FLUX-CORE SOLDER has long been first choice for class assignments in soldering. Its ease of use, speed and efficiency make Kester best for teaching . . . particularly so since your students will undoubtedly be using it when they leave school. Remember Kester Acid-Core Solder for general soldering and Kester Plastic Rosin or "Resin-Five" Core Solder for TV-radio-electrical work.

FREE! Kester Solder Booklets . . . both Instructor and Student Editions. Write today.

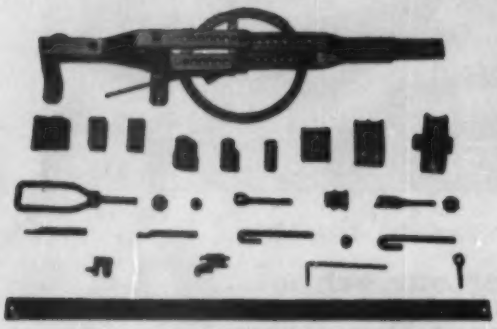
KESTER SOLDER COMPANY

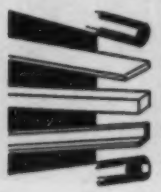
4257 Wrightwood Avenue
Chicago 39, Illinois
Newark 5, New Jersey
Brantford, Canada

TOP Teaching Tool

HOSSFELD *Universal*® IRON BENDER

1 Instructor + 1 Hossfeld Bends All These:





HOSSFELD #1 BENDER. STANDARD EQUIPMENT INCLUDES ALL-PURPOSE DIE SET.

35 years bending experience makes the Hossfeld #1 Iron Bender tops as a tool for school shop instruction, and without equal in maintenance and limited production work.

5 REASONS WHY:

1. WRENCHLESS: Ready to use
2. PRACTICAL: Quick setup
3. ADAPTABLE: Replaces special equipment
4. VERSATILE: Reproduces practically any everyday bend
5. INVALUABLE: As indispensable as a bench vise

Get the Facts: Write Today for Free Literature!

HOSSFELD MANUFACTURING CO.
438 W. 3RD STREET WINONA, MINNESOTA

NEWS NOTES

(Continued from page 14A)

brary from November 13 through December 5, and arranged by Jack La Duke, senior student in the Department of Industrial Education. Arrangements for the exhibit were directed by Dr. G. Harold Silvius, chairman and professor of the department. The teaching aids displayed were procured from over 75 major industrial firms and are available to drafting teachers and students.

Teaching Aids exhibited at the Wayne Education Day held recently

Shown viewing the exhibit on Education Day are, from left to right: Charles R. Strong, drafting teacher at Wilbur Wright Vocational High School; Arnold E. Metz, director of Vocational Education, St. Clair Shores District; Roger Cherry, Jack La Duke, Thomas Lattin, senior students in the Department of Industrial Education; and Jack Duvall, automotive teacher at the Detroit Washington Trade School.

A "Source Index of Teaching Aids for Mechanical Drafting" has been duplicated by the Department of Industrial Education, College of Education, Wayne State University, and is available without cost. A copy of this release may be secured by writing to the Department.

NEW COURSE FOR ELECTRONIC TECHNICIANS

The addition of a convenient new course of study for training electronic technicians has been announced by Mr. M. Dolinko, director of the Radio-Television Institute of New York.

The new course is scheduled to enable a student to complete his radio and television training by attending classes only two nights per week at a cost of only $6.00 per week. Courses are scheduled either Mondays and Wednesdays, or Tuesdays and Thursdays from 6:30 to 10:30 p.m. The same type of convenient schedule is also available for day students, two days a week on either Mondays and Wednesdays, or Tuesdays and Thursdays, from 8:30 a.m., to 3:00 p.m. The tuition for day students is $8.00 per week.

The Radio-Television Institute is licensed by the University of the State of New York, and approved for veterans and foreign students.

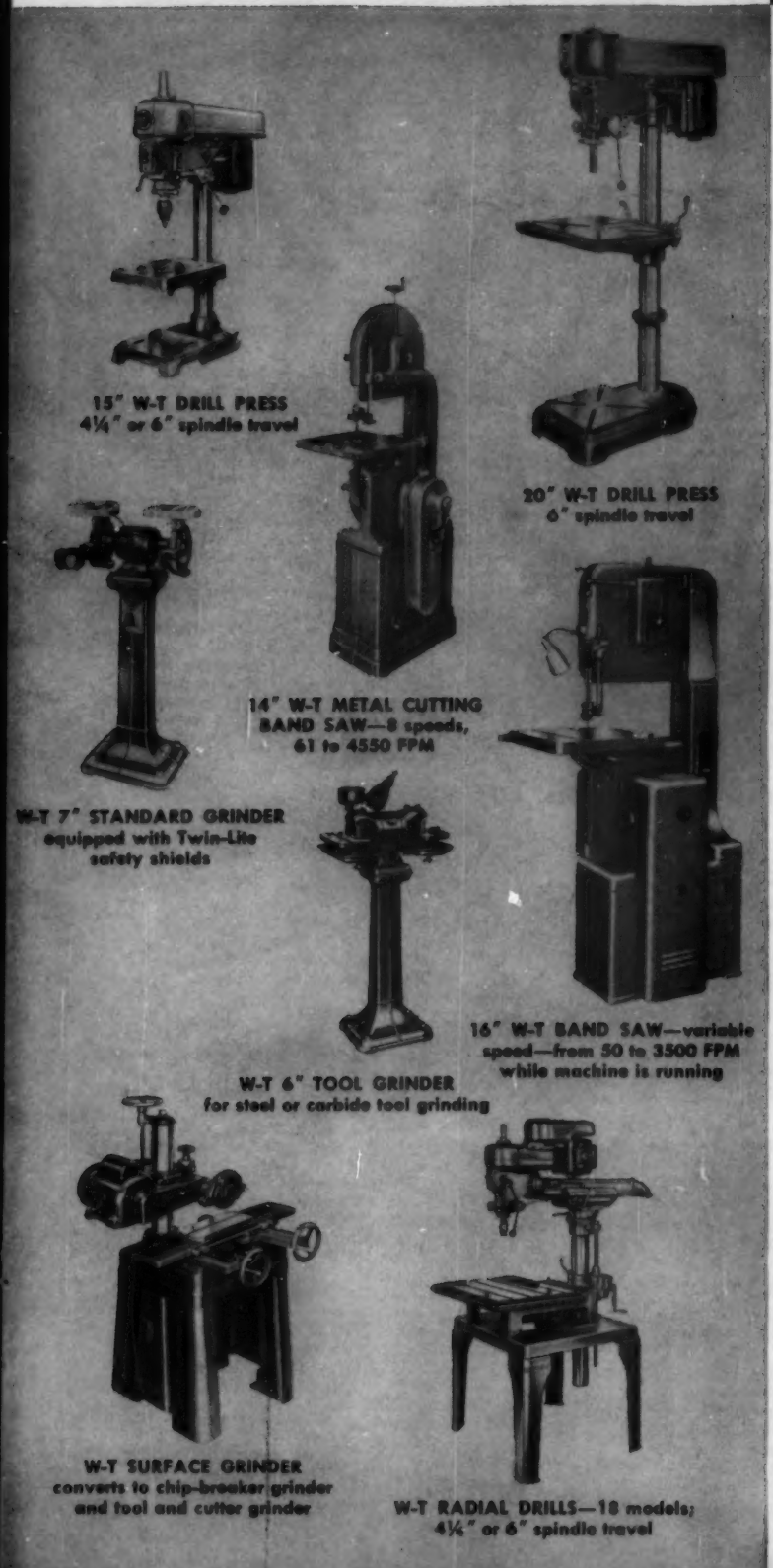
For complete information, contact *Mr. Robert Kerpel, Registrar, Radio-Television Institute, 127 Columbus Ave., New York 23, N. Y.*

(Continued on page 35A)

For better student training . . .

teach with

WALKER TURNER


15" W-T DRILL PRESS
4¼" or 6" spindle travel
20" W-T DRILL PRESS
6" spindle travel
14" W-T METAL CUTTING
BAND SAW—8 speeds,
61 to 4550 FPM
W-T 7" STANDARD GRINDER
equipped with Twin-Lite
safety shields
16" W-T BAND SAW—variable
speed—from 50 to 3500 FPM
while machine is running
W-T 6" TOOL GRINDER
for steel or carbide tool grinding
W-T SURFACE GRINDER
converts to chip-breaker grinder
and tool and cutter grinder
W-T RADIAL DRILLS—18 models;
4¼" or 6" spindle travel

"Light-Heavyweight"
MACHINE TOOLS

- ***Engineered for maximum safety!***
- ***Built to highest industrial standards!***

Any way you judge them, Walker-Turner "Light-Heavyweights" are the finest, most economical metalworking tools for school shop instruction. They're safety-engineered to give maximum student protection, and are built extra rugged to take rough treatment and still give years of accurate service with little or no maintenance problems.

Your Walker-Turner distributor will be glad to demonstrate how Walker-Turner "Light-Heavyweight" Machine Tools can make your teaching job easier and more resultful. He's listed under "Tools" in the Yellow Pages of your telephone directory.

FREE CATALOG!
Write today for free colorful catalog on the complete line of Walker-Turner "Light-Heavyweight" Machine Tools.

WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WB-61, 400 N. Lexington Ave.
Pittsburgh 8, Pa.

Woodworking Equipment, Tools, and Supplies

These lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent, or sound movies, may be used by the students in the industrial arts and vocational education courses.

BENCH
1. Shop, with hardwood tops, 1¾ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
   It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
2. Glue 3. Stain, with metal-covered top
4. Teacher's demonstration

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

DRILL — portable electric

DRILL PRESS — floor or table model

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
1. Automatic knife, direct-motortype. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
2. Bench, hand or power
3. Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
4. Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
1. 6- or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard
2. 12-, 16-, or 18-in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard.

LATHES
1. 6- to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block.
2. Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
1. Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod.
2. Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12-, 18-, 20-, 24-, or 30-in.., motor or belt driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible.

SANDER
1. Belt, direct motor drive
2. Disk, motor or belt driven
3. Oscillating spindle, motor driven
4. Portable, hand-plane type, direct motor drive
5. Vertical spindle and disks sander

SAWS
1. Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
2. Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded
3. Cutoff, pedestal or swing type to be fitted with 12- to 16-in. saw
4. Filing machine, direct motor drive
5. Jig, direct motor or belt driven
6. Portable band saw, 14 to 20 in. ball bearing, motor driven
7. Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
8. Universal saw bench, 14 to 16 in., motor driven
9. Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
1. Motor drive, single or double spindle. Table to be equipped with removable center plate.
2. Portable shaper or router with a suitable selection of cutters

TENNONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class).

Woodworking — Small Tools

AWLS — brad, assorted sizes

BEVELS
1. Protractor
2. Sliding T, 8 in.

BITS
1. Auger, 5/16 to 1 in., inclusive, by 16ths
2. Auger, 5/16 in. to ½ in. inclusive, by 16ths
3. Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
4. Countersink, for wood, rose pattern, ½ in. and ¾ in.
5. Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
6. Expansive, ⅜ in. to 1½ in.
7. Expansive, ⅞ in. to 3 in.
8. Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
9. Screw driver square shank, ¼ in., 5/16 in., ⅜ in.
10. Twist drill for wood, square shank, 1/16 in. to ½ in. inclusive, by 16ths
11. Twist drill, straight shank, 1/16 to ¼ in. inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
1. Bench duster, 10 in.
2. Floor
3. Glue, round, ½ and ¾ in.
4. Glue, round, 1½ in.
5. Marking, camel's hair, No. 1 and No. 2
6. Varnish, flowing, 2 and 2½ in.
7. Varnish, flat, ½, ¾, and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
1. Sets containing 6 tools
2. Sets containing 12 tools

CHISELS
1. Cold, machinists', ¾ and ½ in.
2. Mortising chisel and bits, ¼ to ¾ in. by 16ths
3. Socket firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1½ in.
4. Socket firmer, plain edge, ½, ¾, and 1 in.
5. Tanged firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1¼ in.

CLAMPS
1. Bar, 24, 36, 48, and 60 in.
2. Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

DIVIDERS — wing, 6 in. and 10 in.

DOWEL PLATE — 6 in. long

DOWELING JIGS — with bushings

DRAWKNIVES — 7 in.

DRILL
1. Automatic hand, with 8 drill points
2. Chuck, 0 to ⅜ in.
3. Hand, 0 to ¼ in., for roundshank drills
4. Star, for concrete, ½ and ¾ in.

FILES
1. Auger bit, assorted, 6 in.
2. Cabinet, 8 and 10 in.
3. Card and brush
4. Flat, wood, 10 in.
5. Mill, bastard cut, 12 in.
6. Round, bastard cut, 12 in.
7. Taper, slim, 5½ and 7 in.

FIRST-AID CABINET AND SUPPLIES

GAUGES
1. Bit, adjustable
2. Jointer
3. Marking, metal or hardwood
4. Mortise, metal or hardwood
5. Panel

GLASS CUTTER

GOUGES
1. Tanged firmer, outside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
2. Tanged firmer, inside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
3. Spoon, ½, ¾, and 1 in.

HAMMERS — claw, bell faced, 10-, 12-, 13-, and 16-oz.

HATCHET — bench, 4-in. cut

JARS — earthenware, 1 qt. capacity

KNIVES
1. Jointer, to fit power machine
2. Planer, to fit power machine
3. Sloyd, 3-in. blade

LEVELS
1. Wood, 24 in.
2. Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head

NAIL SETS — 1/16 and 3/32 in. points

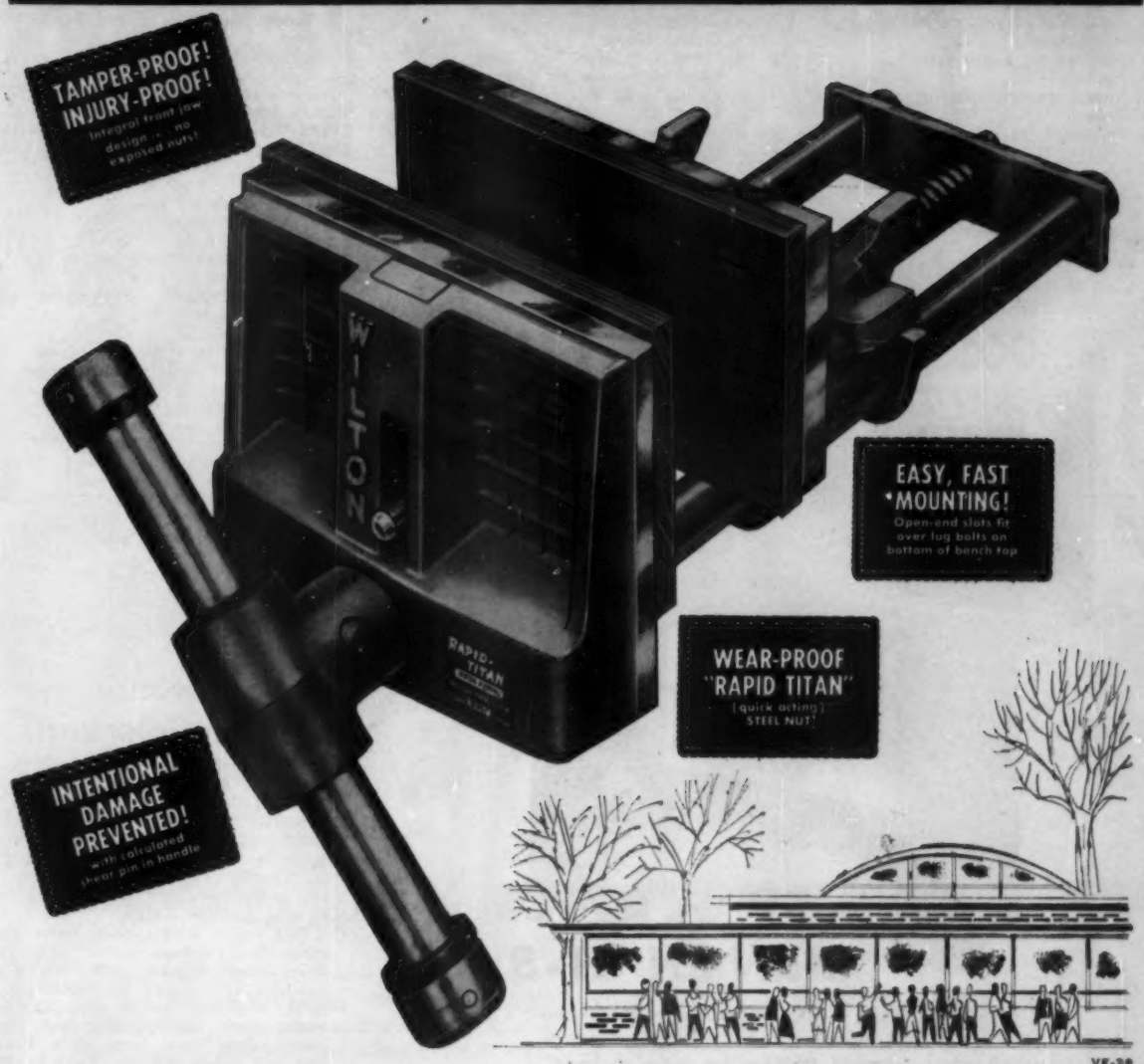
OILERS — bench, ½ pt., coppered, best grade

OILSTONES
1. 1 by 2 by 8 in. in iron box

(Continued on page 32A)

WILTON WOODWORKERS' VISES

. . . . an investment in quality features and boy-proof ruggedness!


TAMPER-PROOF! INJURY-PROOF!
Integral front jaw design — no exposed nuts!
EASY, FAST MOUNTING!
Open-end slots fit over lug bolts on bottom of bench top
WEAR-PROOF "RAPID TITAN"
(quick acting) STEEL NUT
INTENTIONAL DAMAGE PREVENTED!
with calculated shear pin in handle
WILTON
RAPID TITAN

VE-39

Top quality features, modern design, and careful workmanship have made Wilton Woodworkers' Vises the choice of schools who want the finest in shop equipment. Wilton Woodworkers' Vises are available in 16 continuous screw and Rapid Titan (quick acting) models. Unconditionally guaranteed!

ORDER WILTON VISES FROM YOUR DISTRIBUTOR
YOU CAN SPECIFY "FURNISH WILTON" WHEN YOU ORDER ANY NATIONALLY KNOWN BENCH . . .
THE PRICE IS THE SAME. WRITE FOR CATALOG AND TEACHING AIDS

SCHOOL EQUIPMENT SALES DIVISION OF

WILTON

TOOL MFG. CO., INC.
SCHILLER PARK, ILLINOIS
Sold by leading distributors the world over.

(For more information from advertisers, use the postcard on page 91A)

(Continued from page 30A)

2. Gouge slip, medium, 4½ by 2⅛ by ⅜ by 5/16 in.
3. Gouge slip, fine, 3 by 2 by ⅜ by ⅛ in.

PINCERS — 6 in. carpenters'
PINCH DOGS — ¾, 1, and 1¼ in.
PLANES
1. Block, adjustable, 6 in. long, 1⅝-in. cutter
2. Circular
3. Combination, adjustable
4. Core box
5. Duplex, fillister and rabbet
6. Fore, ⅛ in., 2⅜-in. cutter
7. Irons, double
8. Jack, 14 in., 2-in. cutter
9. Jointer, 24 in.
10. Round, wood, 1¾ in.
11. Router
12. Smooth, 9 in., 1¾- or 2-in. cutter

PLIERS
1. Roundnose, 5 in.
2. Side-cutting, 6 in.

PUTTY KNIVES
RASPS — half round, wood, 10 in.
RULES
1. Board
2. 1 or 2 ft. graduated by 8ths and 16ths
3. Shrink, ⅛ and 5/16 in.

SAWS
1. Back, 12 in., 14 point
2. Band, to fit power machine
3. Compass, 10 in.
4. Coping, frames
5. Coping, blades
6. Crosscut, 9 tooth, 22 in. long
7. Crosscut, circular for power machine
8. Dado, ⅛ to 13/16 in. to fit power-saw arbor
9. Hack, frames, 10 in. or adjustable
10. Hack, blades, 10 in.
11. Keyhole, 10 in., 10 point
12. Rip, 7 point, 22 in. long
13. Rip, circular for power machine
14. Set, 10 points per inch and finer
15. Set, 10 points per inch and coarser
16. Turning frame, 14 in.
17. Turning blades, 5/16 by 12 in., 10 tooth
18. Miter box, 24 by 4 in. saw, 7 in. capacity at miter

SCRAPERS
1. Cabinet
2. Glue, triangular
3. Veneer, blade, 2¾ in. long, handle 11 in. long

SCREW DRIVERS
1. Cabinetmakers', 4, 6 and 8 in.
2. Quick return, spiral ratchet

SHOOT BOARD — and plane
SNIPS — tinners', forged steel, 2½-in. cut
SPOKESHAVES — adjustable, raised handle, 10 in. long
SQUARES
1. Combination, 12 in.
2. Try, iron handle, 8 in.
3. Framing, 2 ft.

STEEL FIGURES — hand cut, ⅛ in.
TAPELINE — 50 ft., steel
TRAMMEL POINTS — adjustable metal frame, steel points
TURNING TOOLS
1. Calipers, 6 in. inside and outside
2. Calipers, 12 in. inside and outside
3. Parting tools, ⅛ in.
4. Round point, ¼, ½, and ¾ in.
5. Spear point, ¼, ½, and ¾ in.
6. Square point, ¼, ½, and ¾ in.
7. Turning chisels, ¼, ½, and ¾ in.
8. Turning gouges, ¼, ½, and ¾ in.
9. Turning skews, L.H., ¼, ½, and ¾ in.
10. Turning skews, R.H., ¼, and ½ in.

VISE — 3-in. jaw, anvil face
WRENCHES
1. Adjustable, 8, 10, and 12 in.
2. Headless setscrew
3. Pipe, 10 and 12 in.
4. S type or open-end type to fit ⅛ in. to 1-in. N.C. nuts

ANOTHER FIRST in another growing area of industrial arts and vocational education. A brand new bench which offers complete facilities for teaching basic television and TV receiver servicing. It includes all the fundamental requirements of a television service laboratory. Built by Brodhead-Garrett from specifications by Electronic Industries Association in answer to the growing demand from schools.

• *One of many new items included in our big new 1959 catalog, which will soon be ready for distribution. Watch for your copy.*

Over 50 Years Serving the School Shops of America

BRODHEAD GARRETT CO.
4560 East 71st Street • Cleveland 5, Ohio

Woodworking — Materials and Supplies

ALCOHOL
BENZINE
BRADS — ⅜, ½, and 5/8 in. No. 20; ¾ and ⅞ in. No. 19; 1 in. No. 18; 1¼ and 1½ in. No. 16; 1¾ in. No. 15; 2 in. and 2½ in. No. 14
CARBON PAPER — black
COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermillion
COLORS — ground, in oil or japan; burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermillion
DECALCOMANIA TRANSFERS
DOWEL PINS AND PLATES
DOWELS — hardwood, 3-ft. lengths, ¼, 5/16, ⅜, ½, and ¾ in.
ENAMEL
1. Selected colors
2. Undercoater

FILLERS — paste: natural golden oak, dark oak, and mahogany
FILLETS — leather, ¼ and ½ in.
GLUE
1. Casein, hide, best grade cabinet
2. Liquid

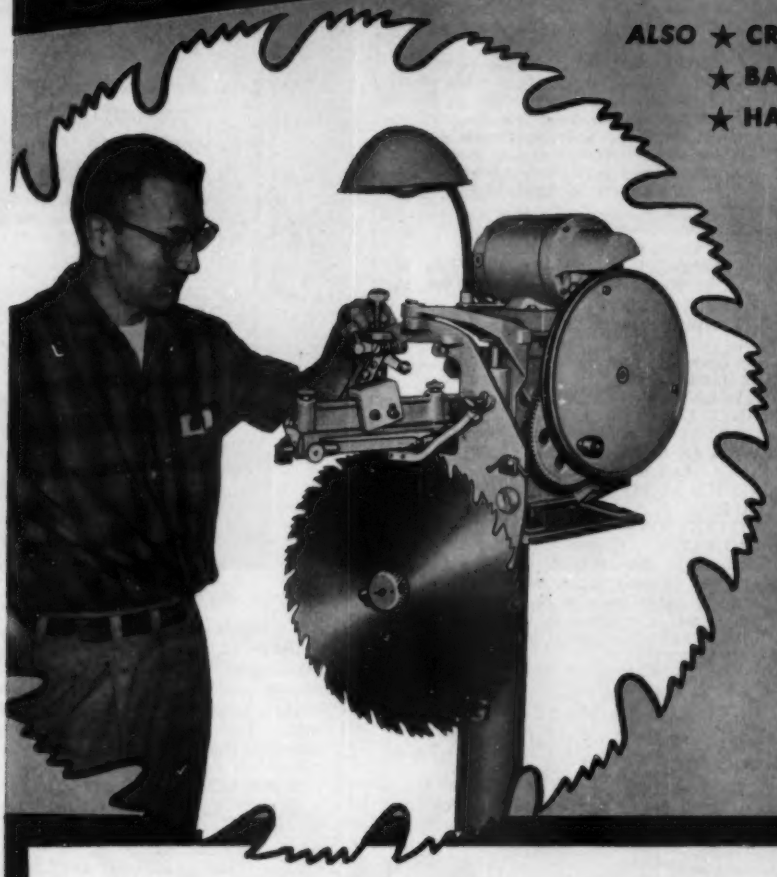
HARDWARE — brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons,

(Continued on page 34A)

Here's the FIRST and ONLY Machine that Automatically Files and Joints

COMBINATION RIP AND CROSSCUT SAWS

ALSO ★ CROSSCUT CIRCULAR SAWS
★ BAND SAWS
★ HAND SAWS



It's the new Model 200

FOLEY *Automatic* SAW FILER

THE NEW model 200 Foley Automatic Saw Filer is the *first* and *only* machine which will file the so-called "combination" (rip and crosscut) circular saws; also crosscut circular saws, band saws, all types of hand saws.

The Foley Saw Filer is doubly valuable in manual training departments—it keeps all your saws in perfect cutting condition at low cost and greatly prolongs their life; it also is a great asset for training students in the correct care and maintenance of both hand and power saws. With the Foley Saw Filer, the Foley Retoother (for hand saws) and Foley Power Setter, (last two not shown) you can sharpen *4 to 6 hand saws per hour.*

The exclusive Foley principle of jointing the saw as it is filed, keeps all teeth uniform in size, shape and spacing; it also keeps circular saws perfectly round. This assures a fast, smooth, true cutting saw that stays sharp longer, runs cooler, and frequently doubles the life of the saw.

30-DAY TRIAL OFFER

You may try the new Model 200 Foley Saw Filer in your own shop for 30 days. See for yourself its precision work, advanced design and quality construction—time-proved through more than 50 years manufacture and use of previous models. Write for literature and details of 30-day trial offer.

FOLEY MANUFACTURING COMPANY
3318 N. E. 5th St., Minneapolis 18, Minn.

(For more information from advertisers, use the postcard on page 91A)

SEND FOR CATALOG

NAME

TITLE

SCHOOL

STREET

CITY/STATE

BEST

MACHINISTS

QUALITY

WOOD WORKERS

VISES

HINGED PIPE

FOR

DRILL PRESS

SCHOOLS

You can fill every vise requirement from the broad Simplex line of fine vises for schools. Guaranteed for the life of the vise against defects in workmanship or material. Get industrial quality for your shop now.

Desmond Simplex

The Desmond-Stephan Mfg. Co.
URBANA, O.

(Continued from page 32A)

corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
1. And eyes
2. Cup
3. Screw
4. Square screws

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine
In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking
Hardwood for furniture should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
1. Common, 6d, 8d, and 10d
2. Flathead, ½ in. No. 20, ¾ in. No. 19, 1 in. No. 18, 1¼ in. and 1½ in. No. 16, and 2 in. No. 14
3. Finishing, 4d, 6d, and 8d

OIL
1. Linseed, boiled
2. Linseed, raw
3. Machine
4. Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, ½, 1
Garnet finishing paper, 6/0, 4/0
Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
1. Flathead, brass. No. 3 by ⅜ in., No. 4 by ½ in., No. 5 by ⅝, and ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, 1½ and 2 in., No. 12 by 1¼, 1½, and 1¾ in.
2. Flathead, bright, No. 3 by ½ in., No. 4 by ½ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1, and 1¼ in., No. 10 by 1¼, 1½, and 1¾ in., No. 12 by 1½, 1¾, and 2 in., No. 14 by 2¼ and 2½ in.
3. Oval head, brass, No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., and No. 10 by 1¼ in.
4. Roundhead, blued, No. 3 by ⅜ and ½ in., No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, and 1½ in., No. 12 by 1½ in.
5. Roundhead, brass, No. 3 by ⅜ in., No. 4 by ½, and ⅝ in., No. 5 by ¾ in.

SHELLAC
1. Orange, cut 4 lb. to the gal.
2. Sticks, assorted colors
3. White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers

STAINS — oil, spirit, or water. Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut

STEEL WOOL — No. 0 and No. 2/0

TURPENTINE

TWINE

VARNISH — coach, flat, remover, spar, and rubbing

WASTE — cotton, white

WAX — bees and finishing

WHITE LEAD

NEW LEARNING UNIT

STUDENTS BUILD

WATER SKIS

from quality S-4-S (bent only) stock— finest grade fittings supplied

Students start with rough pre-bent blanks shown here

Now any student can own the finest water skis it is possible to build and, at the same time, increase his woodworking skills. The ski blanks and fittings are supplied by one of the world's largest producers of quality water skis. Scale drawings and instruction sheet included.

SPECIFICATIONS:

Stock ⅝" thick x 7" wide x 6' long. Permanently bent at one end with hardwood spline reinforcing toe of ski. Choice of Marine Plywood with Crezon surface, Sitka Spruce, Philippine Mahogany, Solid White Ash. BINDINGS: White Neoprene rubber. Aluminum parts, single adjustment, self-locking heel plate.

Ask one of these distributors for full details and prices.

Brodhead-Garrett Company, Cleveland, Ohio
General Hardwood Company, Tacoma, Washington
J. E. Higgins Lumber Company, San Francisco, Calif.
Omaha Hardwood Lumber Co., Omaha, Nebraska
Frank Paxton Lumber Company, Kansas City, Missouri; Chicago, Illinois; Milwaukee, Wisconsin; Denver, Colorado; Des Moines, Iowa; Fort Worth, Texas; Midland, Texas.
Lumber Products, Portland, Oregon
Southwest Supply Co., Inc., Glendale, California
Strable Lumber Company, Oakland, California
Stovall-Peterson Hardware Co., Salt Lake City, Utah
L. E. Vinson & Company, Tucson, Arizona
Winde-McCormick Lumber Co., Charlestown, Massachusetts; Providence, Rhode Island
Youngblood Lumber Company, Minneapolis, Minn.
Atlanta Oak Flooring Co., Atlanta, Georgia

Manufactured by

WESTERN WOOD MFG. CO. • Portland, Oregon

(For more information from advertisers, use the postcard on page 91A)

NEWS NOTES

(Continued from page 28A)

STUDY PROGRAM ESTABLISHED IN TEXAS

A program establishing a commission to study vocational education and industrial arts in Texas has been announced by J. W. Edgar, state commissioner of education.

The commission, which is composed of representative high school teachers and principals, superintendents, school board members, and college teachers and officials will: Recommend standards for the program, formulate statements concerning the place of vocational education and industrial arts in the curriculum, review the legal framework for the program, determine whether the present program should be revised, recommend improvements needed, if any, in teacher education, make recommendations concerning textbooks and instructional materials, and study the relationship between vocational education and industrial arts in Texas schools.

This commission is divided into five committees to study the programs in vocational agriculture, trade and industrial education, homemaking, distributive education and industrial arts.

Dean James R. D. Eddy of the University of Texas is chairman of the commission to study trade and industrial education.

Dr. Chris H. Groneman of the Agricultural and Mechanical College of Texas is chairman of the committee to study industrial arts programs.

ARC WELDED PROJECTS FOR THE SCHOOL SHOP

The James F. Lincoln Arc Welding Foundation has published a new 46-page booklet, "Arc Welded Projects for the School Shop," as an aid to arc welding practice in industrial arts shops and as a stimulus to welded project design. The book contains information for making 25 useful and interesting shop projects, for each of which is given a photograph, a bill of material, construction suggestions, and detailed plans. The projects all have been constructed in school shops and were selected for publication on the basis of general interest for the student, welding practice involved, degree of complexity, and quality of design.

William A. Sellon of the Department of Industrial Arts Education, Bemidji State College, an experienced welding instructor and author of welding instruction materials, selected the projects and prepared them for publication. Projects range from a simple foot scraper to a table saw, and cover household, yard, and sport equipment as well as shop tools. A large bibliography lists other projects that have been published in books and periodicals since 1947.

The 46-page booklet, 8½ by 11 in., is well illustrated, price 50 cents, postage paid in U. S. A., 75 cents elsewhere. *James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio.*

NEW PRIMARY FILM

Bailey Films, Inc., announce the new primary film — "The Miller Grinds Wheat." It is the third production of Charles Betts and Virginia Lawrenson of Alhambra City Schools, Calif.

This film is designed to show primary children how wheat is brought to the mill, ground into flour, sifted, poured into sacks, and loaded on trucks for delivery to bakeries.

The film is 10 minutes in length, available for purchase in color, and black and white. Rental prints are also available from *Bailey Films, Inc., 6509 De Longpre Ave., Hollywood 28, Calif.*

(Continued on page 42A)

HERE'S PROOF OF PERFORMANCE:
"My eight Clausing 6328 Lathes are the finest lathes for instructional use I have ever seen. Their safety features, ruggedness and ease of operation make them tops in their field. They offer so many more features than any other lathe that I would vote for a Clausing every time."
Harold Burgan, Spokane, Washington

CLAUSING 6300-series 12¾" LATHES
are "TOPS for safety . . . ruggedness . . . ease of operation"

Harold Burgan's statement above is typical. Instructors everywhere report Clausing Lathes set the standard for safety, rugged construction, ease of operation and Value! Here are a few reasons why:

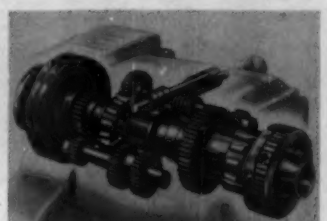
Headstock, apron and quick-change are *totally enclosed* . . . inquiring fingers can't get into these danger zones, nor can dirt or chips . . . all gears and shafts travel in a bath of oil. All controls . . . including those for back gear engagement . . . are located outside machine. Spindle nose is tapered Key-lock . . . eliminates danger of chuck run-off on braking or reversing.

Flame hardened bed ways for longer wear are standard equipment *at no extra cost.* Spindle is forged steel, turns on Timken "Zero-Precision" tapered roller bearings. Apron and quick-change gears are protected by safety devices . . . lead screw has easy-to-replace shear pin.

Drive is underneath . . . no exposed belts or pulleys. Has heavy-duty ball bearing countershaft. Two V-belts drive the spindle . . . belts are outboard for easy replacement.

Get the facts and compare with any other lathe in its class . . . feature for feature, dollar for dollar. We know you'll agree Clausing 6300-series are today's outstanding values . . . *the* lathes for *your* shop. Write for illustrated literature today.

Quick-change box, too, is totally enclosed and gears and shafts turn in bath of oil . . . another important safety and long-service-life feature exclusive with Clausing in lathes of its class.



Enclosed construction of headstock provides greater rigidity, safety . . . longer service life. All gears, shafts and bearings travel in a pumped bath of oil.

CONDENSED SPECIFICATIONS

Swing over bed	12¾"
Between centers	21½", 33½", 47"
Hole thru spindle	1⅜"
Thread range	54 selections, 4 to 224
	Standard right or left
Motor recommended	1 or 1½ HP, 1 or 2 speed

CLAUSING

CLAUSING DIVISION
ATLAS PRESS COMPANY
3-121 N. PITCHER ST. • KALAMAZOO, MICH.

(For more information from advertisers, use the postcard on page 91A)

Automotive Equipment, Tools, and Supplies

This list of automotive equipment tools and supplies was prepared by the Automotive Industry — Vocational Education Conference on public school automotive instruction. It is reproduced here by permission for which A. D. Althouse, Detroit Board of Education and co-chairman of the conference, deserves special credit.

Because yearly changes in car and truck design often necessitate new service procedures, and consequently new types of tools, shop equipment must be replaced when it becomes obsolete as well as when it wears out.

The Automotive Industry — Vocational Education Conference therefore suggests the following amortization policy: hand tools, 2 years; special tools and testing devices, 5 years; and automotive parts, 3 years.

Supplies and Equipment

AIR HOSE
25' length, ¼" I.D., 5 ply red, complete with ¼" pipe fittings

BATTERY BOLTS
5/16" x 1½" U.S.S. lead coated battery terminal bolts complete with nuts

BATTERY CLIPS
1. "B" battery clips cadmium plated
2. 50 ampere battery charging and test clips, lead coated

BATTERY COMPOUND — battery sealing compound

BINDING POSTS — screw type

BLADES
1. Hand hack saw, 24 teeth per inch
2. 10", 32 teeth per inch hand hack saw

BRUSHES
1. 1½" flat
2. 14" x 1½" steel wire, curved handle
3. 6" diam. steel, wheel
4. 8" bench or counter

BULBS
1. Auto lamp bulbs, 6 and 12 volt
2. Lamp auto, sealed beam No. 50–40 watts, double filament, three contact, 6 and 12 volt
3. Battery charger bulb (specify ampere capacity)

CABLE
1. Extension cable, double conductor, molded rubber covered, 18 ga. heavy duty
2. Primary, single conductor, stranded copper braid and lacquer covered, 14 gauge
3. Secondary, 7 millimeter, rubber, braid lacquered brown
4. Starter cable, No. 1 gauge rubber and woven cover insulation.
5. Starter cable, No. 6 gauge rubber and woven cover insulation

CABLE TERMINALS
1. Battery cable ground lugs for No. 1 starter cable
2. Battery cable ground lugs for No. 6 starter cable
3. Battery cable terminals, universal type or equal
4. Clip type, high tension terminal for 7mm. cable
5. Terminals, as-sos-11 solderless
6. Terminals, 5/16" hole primary
7. Terminals, 5/16" spade type primary

CHECKS, TOOL — brass. 1" round

CLEANING COMPOUND
Oakite, Stoddart solvent or other material depending on the type of cleaning tank used.

CLIPS — crocodile

COTTER PINS
1. 3/16" x ¾", box of 1000
2. 5/32" x 1", box of 1000
3. ⅛" x 1½", box of 1000

DRILLS
1. H.S.S., ⅛", jobbers, straight shank
2. H.S.S., 9/64", jobbers, straight shank
3. H.S.S., 13/64", jobbers, straight shank
4. H.S.S., 7/32", jobbers, straight shank
5. H.S.S., ¼", jobbers, straight shank
6. H.S.S., 17/64", jobbers, straight shank
7. H.S.S., 9/32", jobbers, straight shank
8. H.S.S., 21/64", jobbers, straight shank
9. H.S.S., 23/64", jobbers, straight shank
10. H.S.S., ⅜", jobbers, straight shank
11. H.S.S., 25/64", jobbers, straight shank
12. H.S.S., 27/64", jobbers, straight shank
13. H.S.S., 7/16", jobbers, straight shank
14. H.S.S., 29/64", jobbers, straight shank
15. H.S.S., ½", jobbers, straight shank

DRY CELL
No. 6 drv cells, with screw connections

EMERY CLOTH — No. 2/0, 9" x 11"

FILE
1. 10" flat bastard (24 minimum)
2. 10" half round bastard (6 minimum)
3. 10" half round lead float (4 minimum)
4. 10" hand smooth (12 minimum)
5. File handle, large, medium, small (specify size), (24 minimum)
6. 10" mill smooth (12 minimum)
7. 10" round bastard (6 minimum)
8. Ignition point file (10 minimum)
9. Regulator point file, Delco-Remy model W-19
10. 6" saw file, extra slim taper (4 minimum)
11. Warding, 6" smooth (4 minimum)

FUSES — automobile Nd. 3 ag, 20 amp.

GASOLINE — commercial grade (as needed)

GAUGE (thickness gauge)
1. .002" thickness, ½" width, ground thickness gauge stock
2. .003" thickness, ½" width, ground thickness gauge stock
3. .005" thickness, ½" width, ground thickness gauge stock
4. .010" thickness, ½" width, ground thickness gauge stock
5. .015" thickness, ½" width, ground thickness gauge stock

GREASE
Chassis, purchase in quantity depending on amount used

GRINDING COMPOUND
2 compartment oil mixed grades A & E

GRINDING WHEELS
When requesting grinding wheels for replacement purposes, be sure to specify the material bond, grain, size, and hardness or grade

HANDLE, HAMMER
1. 14" length, 16 oz. machinist's
2. 18" length, 24 oz. machinist's

HOSE
1. ¾", rubber, 2 ply, 50' lengths
2. Radiator hoses are molded for specific cars

HOSE CLAMPS
Universal type, to fit 1" to 3" O.D. hose

HYDRAULIC BRAKE FLUID

HYDROMETER FLOATS
1. Automobile storage battery, hydrometer float only
2. Automobile radiater hydrometer float only, calibrated for alcohol, glycerine, and prestone

INSULATOR
1. Rubber to fit mueller No. 85 clips, red mueller No. 87
2. Rubber to fit mueller No. 85 clips, black mueller No. 87

NUTS, MACHINE SCREW
1. No. 6–32, hex, steel
2. No. 8–32, hex, steel
3. No. 10–24, hex, steel

NUTS
1. ¼"–20 hex, semifinished
2. 7/16"–18 hex, semifinished
3. ⅜"–16 hex, semifinished
4. 7/16"–14 hex, semifinished
5. ½"–13 hex, semifinished
6. ¼"–28 hex, semifinished
7. 7/16"–24 hex, semifinished
8. ⅜"–24 hex, semifinished
9. 7/16"–20 hex, semifinished
10. ½"–20 hex, semifinished

NUTS
1. ¼"–28 castellated hex, semifinished
2. 5/16"–24 castellated hex, semifinished
3. ⅜"–24 castellated hex, semifinished
4. 7/16"–20 castellated hex, semifinished
5. ½"– castellated hex, semifinished
6. ¼"–20 castellated hex, semifinished
7. 7/16"–18 castellated hex, semifinished
8. ⅜"–16 castellated hex, semifinished
9. 7/16"–14 castellated hex, semifinished
10. ½"–13 castellated hex, semifinished

OIL — S.A.E. No. 30, engine oil (as needed)

PAINT (for shop maintenance)
1. Black, quick drying enamel
2. Red, quick drying enamel
3. White, quick drying enamel
4. Machine enamel, gray

PANS
Automobile drain pans, approximately 3 gallon capacity, height not to exceed 5", galvanized

PLUGS
1. Attachment, molded soft rubber two prong, body only
2. Attachment cap only
3. Three prong for grounding

RAGS
Wiping, bleached and washed. (Some schools may prefer to use wiping rags supplied and washed by a local laundry service)

SAFETY WASHERS (grinding wheel)
Order by pair, specify arbor size and diameter flange for grinding wheels

SALAMMONIAC — for cleaning soldering coppers

SANDPAPER
1" width, No. 00, 50 yd. roll for commutators

SCREWS, MACHINE
No. 6–32 x 1", round head
No. 8–32 x 1½", round head
No. 10–24 x 2", round head

SCREWS, CAP
¼"–20 x 1¼", hex.
5/16"–18 x 1½", hex.
⅜"–16 x 1¼", hex.
½"–13 x 2", hex.
¼"–28 x ¾", hex.
5/16"–24 x 1¼", hex.
⅜"–24 x 1½", hex.
7/16"–20 x 1¼", hex.
½"–20 x 2", hex.

SHELLAC — white, 4 pound cut

SOCKETS, LIGHT
1. Dash light, double contact, 6 volt
2. Dash light, single contact, 6 volt

SOLDER, PASTE — all purpose, noncorrosive

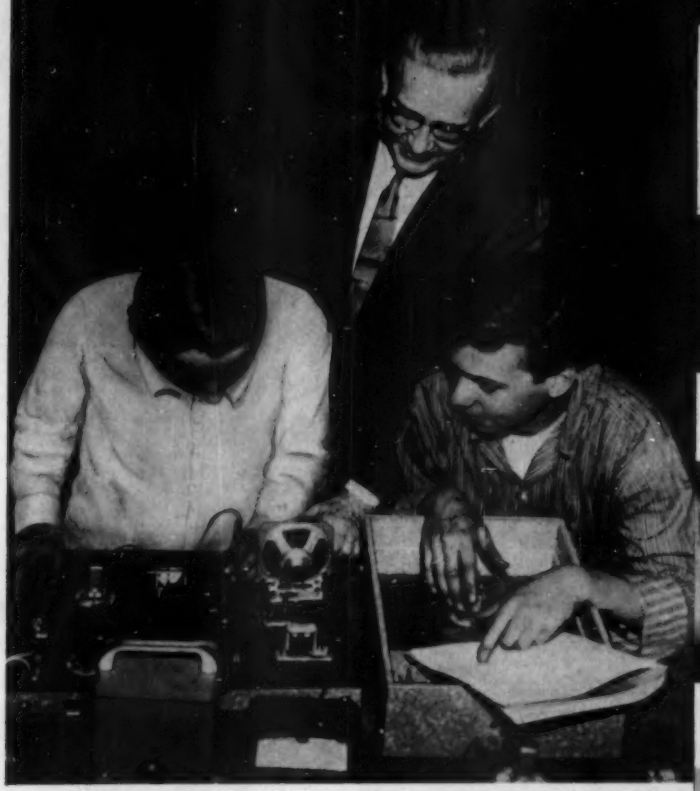
SOLDER WIRE
No. 5 spools. ⅛" diameter, 50–50 alloy

SPARK PLUGS
1. 14 millimeter metric
2. 18 millimeter metric

STAPLES — insulated, ½"

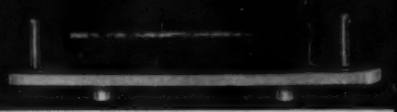
(Continued on page 38A)

"My Students Learn Electricity and Electronics Easier with the ErecTronic® System"



Mr. Stanley Gardner, electronics instructor at Newton Technical High School, Newton, Mass., whose statement appears above, is shown observing two students who are constructing a circuit from an EIA Manual.

Here's Why ErecTronic Kits Make Learning and Teaching Easier!



Components and other parts are factory-mounted on high-impact polystyrene bases which have two plug-in pins.

Precision-drilled Duron lids provide working surface which holds mounted parts firmly, yet allows easy removal.

This phospher bronze Jiffy Connector used in ErecTronic Kits has made over 7,000 positive electrical connections. It still retains its initial resiliency.

The ErecTronic System of Laboratory Instruction makes the teaching and learning of basic electricity and electronics fast and practical. Students can build and rebuild circuits on a peg board without soldering with simple plug-in mounted components and Jiffy connectors. Supervision and checking time is reduced. Working from Electronic Industries Association Manuals, students can build circuits as fast as they can think.

These EIA (formerly RETMA) Manuals provide a laboratory program of over 125 jobs in logical sequence from which the student learns basic technical knowledge starting with Ohm's Law and progressing to television receivers, including transistors.

ErecTronic Kits are economical because parts can be used over and over again, and silk screen storage panels provide quick visual inventory check. Write today for new Catalog ED-6 A.

Training Kits, designed for use with the clear, concise Laboratory Manuals prepared by the teaching staff of EIA, are available.

SCIENCE ELECTRONICS, INC.
195 MASSACHUSETTS AVENUE, CAMBRIDGE 39, MASS.

(For more information from advertisers, use the postcard on page 91A)

Featuring

GUARANTEED QUALITY SCHOOL SHOP LUMBER

Write today for this new, 36-page catalog—1959-S. Different from most catalogs, it contains the following information you'll find helpful.

- Illustrations and text describing characteristics of 16 species of lumber used in School Shop projects.
- Information on drawing boards, dowels, turning squares, plywoods, economical "shorts" and water ski equipment.
- Delivered prices for cities east of the Mississippi; f.o.b. prices to points west of the Mississippi.
- List of 24 excellent Project and Instructional books, with details of content and prices.

When you buy HARCO lumber, you get guaranteed quality! Our School Shop lumber is guaranteed as to species, seasoning, texture and grade — assuring maximum usability and minimum waste.

For free catalog, write Hardwood Corporation of America at the address below.

HARDWOOD CORPORATION OF AMERICA

Educational Lumber Division
P. O. Drawer 1091 — ASHEVILLE, N. C.

AUTOMOTIVE EQUIPMENT

(Continued from page 36A)

TAPE
1. ¾" friction tape
2. ¾" rubber tape

TIRE REPAIR KIT
Garage size, red, 450 sq. in., ¼ pint cement

TIRE REPAIR CEMENT
½ pint can with brush in can

THERMOMETERS (Lab.)
Calibration 10° F.-220° F., 12" length, glass stem

TUBING FITTINGS
1. Flare nuts, 7/16" x 20 for ¼" sae flared fittings
2. Half union, ¼" sae flare x ⅛" standard pipe
3. Shut-off cocks, ¼" D.D. tubing on each end, compression type
4. Shut-off cocks, ¼" D.D. tubing on each end, sae flare type
5. Unions, ¼" compression type x ⅛" compression type
6. Unions, ¼" sae flare x ¼" flare
7. Unions, 5/16" sae flare x 5/16" flare
8. Unions, 5/16" compression type x 5/16" compression type
9. Shut-off cocks, 5/16" O.D. tubing on each end, compression type
10. Shut-off cocks, 5/16" O.D. tubing on each end, sae flare type
11. Sleeves, 5/16", compression sleeves
12. Nuts, 7/16" x 20 nuts for ¼" O.D. compression fittings
13. Flare nuts ½" x 20 for 5/16" sae flared fittings
14. Half union, ¼" tubing size, compression x ⅛" standard pipe
15. Half union, 5/16" tubing size, compression x ⅛" standard pipe
16. Sleeves, ¼" compression sleeves

TUBING
1. ¼" O.D. annealed copper, automotive
2. 5/16" O.D. annealed copper, automotive
3. 2¼" O.D. flexible metal, galvanized steel for exhaust lines

WASHERS, FLAT
1. ¼", 18 gauge thickness
2. 5/16", 16 gauge thickness
3. ⅜", 16 gauge thickness
4. 7/16", 14 gauge thickness
5. ½", 14 gauge thickness

WASHERS, LOCK
1. ¼"
2. 5/16"
3. ⅜"
4. 7/16"
5. ½"

WIRE
1. No. 18 single strand copper, cotton covered
2. No. 24 single strand copper, single cotton and enamel covered
3. Resistance wire, chromel No. 27, 3.25 ohms per ft.
4. Bonding wire, annealed iron, stove pipe No. 16

Hand Tools

Numerous hand tools are needed in an auto shop since this is a service trade. Tools should be the type used currently in the trade and should be sturdy, simple and practical. In purchasing tools, particular attention should be given to the alloy content, heat treatment, and guarantee.

(Continued on page 44A)

NEW

water-based non-flammable

THE MOST IMPORTANT ADHESIVE DEVELOPMENT IN YEARS!

- **no fire hazard**—absolutely non-flammable.
- **non-toxic**—will not harm skin, no dangerous fumes.
- **no mess**—washes off hands and equipment with warm, soapy water.
- **economical**—same amount goes TWICE as far, spreads more evenly.
- **easy to apply**—use brush, roller or spray . . . no thinning needed.
- **dries fast**—tells you when its ready to bond by color change.
- **strong bond**—holds just as well as solvent-type . . . highly heat resistant.

Get your catalog sheet on this sensational new product today. It has complete price list and stock numbers for easy ordering. Write The Borden Chemical Company, Consumer Products Dept. IA-39, 350 Madison Avenue, New York 17, N. Y.

DI-ACRO BENDER!

BEST BUY IN A BOYPROOF BENDER!

for Years Of Use

"The Best is the Cheapest" is one of the many common sense sayings attributed to Ben Franklin. The solid base casting and the hardened and ground steel mounting plate in a Di-Acro Bender help to make this machine the best. A smooth, easy bending action turns on a ring of Torrington roller bearings to retain hair-width accuracy year after year. For years of use this "boyproof" bending machine is the wisest investment for YOU.

Your Di-Acro Bender will form a wide variety of shapes quickly, smoothly with a minimum of setting up. You can make centered eye and off center bends, circles, zero radius bends, scrolls, squares, coils, loops and spirals *with attachments furnished in bender accessory kits.* Additional attachments can be made up readily as a part of student project development.

The bending procedures your students learn on a rotary type Di-Acro Bender are those used by industry. Five models in all. Write for details.

ROUND BAR SQUARE BAR TUBING FLAT STOCK HEX STOCK

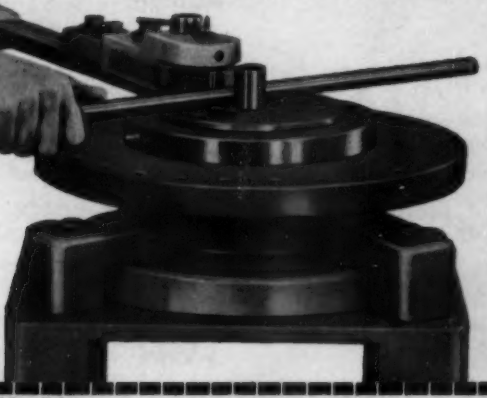
YOU CAN BEND THESE MATERIALS AND MORE WITH A DI-ACRO BENDER

BENDER MANUAL–FREE
Send coupon for your free copy of "It's Easy To Bend". This 32-page book diagrams and describes techniques such as bending centered eyes in one operation, bending tubing without collapsing walls, etc.

BENDER PROJECTS—25c
Eight exciting projects in modern wrought-iron. Be sure to send coupon for this instructor's folio. Projects are diagrammed and dimensioned to facilitate instruction in bender operation. Send 25c in cash, check or money order for set of eight projects.

16mm BENDER FILM
Highly praised by instructors who have used it, this film provides an overview to the importance of bending as a process in the metalworking industry. Also, contains some step-by-step procedures. Seventeen minutes in length, you may book this sound-color film at no charge.

Pronounced die-ack-ro



"You save on Machinery Package Deals —write for information."

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.
351 8th Avenue, Lake City, Minnesota

Please send bender information

☐ bender projects (enclose 25c for set of eight)
☐ free bender manual ☐ bender film information — to:

NAME_____

NAME OF SCHOOL_____

ADDRESS_____

_____

YOUR POSITION_____

(For more information from advertisers, use the postcard on page 91A)

Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

BENCH GRINDER

BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets

BITS
1. Auger, ¼ in. to 1 in. by 16ths
2. Auger, 11/16 in., 18 in. long
3. Drill for wood, square shank, ⅛ in. to ½ in. by 16ths
4. Expansion
5. Extension, 18 in.
6. Screw driver, ¼ in.

BLACKBOARD — permanent or portable

BLOWTORCHES — 1-qt. size

BOOKCASE

BRACES — ratchet type, 8-in. swing

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.

CHAIRS — teacher's and tablet arm

COMPASS SAW

COIL
1. Spreader
2. Taper
3. Winder

DESK — teacher's, with drawer compartments

DRILL
1. Breast
2. Concrete, ⅜ in., ½ in., ¾ in., 1 in.
3. Hand
4. Portable, electric
5. Twist, 1/32 in. to ½ in. by 64ths

DRILL PRESS
1. Bench, hand, or power driven
2. Heavy, power driven

FILES

FIRST-AID CABINET AND SUPPLIES

HACK SAW
1. Blades, 10 in., 24 tooth
2. Frames adjustable

HAMMERS
1. Claw, 12 oz.
2. Machinist's, ball peen

HICKEY — ½ in. and ¾ in.

HOLE SAWS — selected sizes

LATHE
1. Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
2. Speed

PLIERS
1. Gas, 6½ in. and 8 in.
2. Side cutting, 6 in.

PUNCH — for metal molding

PUNCHES — assorted

REAMERS
1. Pipe burring, ¼ in. to 1 in.
2. Pipe burring, ½ in. to 2 in.

RULES
1. 48 in. zigzag
2. 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.

SHEARS — for cutting metal molding

SOLDER DIPPERS

SOLDERING COPPERS
1. Assorted
2. Electric
3. Handles

STOCKS AND DIES — for pipe threads, ½ in. to 1 in.

VISES
1. Machinist's, 4 in.
2. Pipe

WRENCHES
1. Adjustable, 6 in. and 8 in.
2. Pipe, 10 in., 12 in., and 14 in.
3. Socket, combination

Electrical Shop — Supplies

ABRASIVE CLOTH — aluminum oxide, 1, 1½, and 2 in. wide

ARMORED CABLE
1. 2 wire, No. 14, single strip
2. 3 wire, No. 14, single strip
3. Box connectors

ATTACHMENT PLUG

BAR HANGERS

BATTERIES — dry cells

BATTERY ACID — 1.300

BATTERY SEALING COMPOUND

BOX CLEATS

BRADS — ¾ in., No. 19 and 1½ in., No. 16

BRAKE LINING — ¼ by 2 in.

BRUSHES — carbon, for motors and generators

BURGLAR CONTACTS
1. Open circuit
2. Closed circuit

BUSHINGS
1. Loom, No. 1 and No. 2
2. "Jiffy" loom, No. 2

BUZZERS

CLEATS — unglazed porcelain, 2 wire

CLIPS — test, with insulators, Universal, Nos. 22, 23, 24 and 25

COMMUTATOR CEMENT

CONDUIT
1. Bushings, ½, ¾, and 1 in.
2. Box connectors, for flexible
3. Couplings, for flexible
4. Lock nuts, ½, ¾, and 1 in.
5. Rigid, ½, ¾, and 1 in.

CONDULET
1. Fillings, ½ in., LL, LR, and LB
2. Covers, ½ in., blank

DOOR OPENERS — mortised

FISH PAPER — .0125 in. thick

FIXTURES — brass, chain, suspension

FIXTURE STUDS

FUSES
1. Plug type, renewable, 125 volt, 15 amp.
2. Cartridge type, renewable, 125 volt, 30 amp.
3. Renewals for plug fuses
4. Renewals for cartridge fuses

GROUND CLAMPS — ⅜ to 1 in. assorted

HICKEY GRIPS — ½ and ¾ in.

LAMPS
1. Mazda, selected as wattages and voltages
2. Guards for brass sockets

LEATHER NAIL HEADS

LUGS — 25 and 50 amp.

LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides

MOLDING
1. Metal
2. Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing

NUTS — iron, 4-36, 6-32, 8-32, 10-24, 12-24, 10-32, 14-20

OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening

PIPE STRAPS — galvanized, ⅜, ½, ¾, and 1 in.

PUSH BUTTONS
1. Return call, 3 point
2. Single

RECEPTACLES
1. Flush, duplex
2. Porcelain cleat, 660 watt, 250 volt
3. Concealed
4. Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries

RELAYS — Dixie

RESISTANCE BOARDS — for testing

RESISTANCE UNITS — 125-ohm

RHEOSTATS
1. Compression, 275 watt
2. Field, for shunt and compound motors

ROSETTES — wood

ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.

SCREWS
1. Anchors, 8/32, 10/24, 12/24, 14/20
2. Machine, roundhead, 4-40 by ⅛ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ¾ in., 8-32 by ½ in., 8-32 by 1 in., 10-32 by ¾ in., 10-24 by ⅜ in., 10-24 by ¾ in., 10-32 by ¾ in., 12-24 by 1 in.
3. Machine, brass, roundhead, 4-40 by ⅛ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ½ in.
4. Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in, No. 8 by 1½ in., No. 7 by 2 in.
5. Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red

SOCKETS
1. Brushed, brass pull chain, keyless, key
2. Porcelain, keyless, with caps
3. Porcelain, key, with caps

SOCKET CAPS — ¼ and ⅜ in. bushed

SOLDER WIRE — 50/50 size, No. 10

SOLDERING PASTE — 2-oz. cans, noncorrosive

SOLDERING SALTS — 1-oz. cans, noncorrosive

SPEED COUNTERS — 0–9999

SPLIT KNOBS — porcelain

SPRING BALANCES — 0–30 lb.

STARTING BOXES
1. For compound motors, various makes
2. For shunt wound, 1 h.p., 110-volt motors. Overload release
3. For shunt wound, 1 h.p., 110-volt motors. No voltage release
4. Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt

SWITCH
1. Battery, 4 point
2. Bases, porcelain, for 10-amp. switches
3. Boxes, 2¾ in. deep
4. Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
5. Entrance, safety, 3 pole, 30 amp., 250 volt
6. Flush, push button, S.P., D.P., 3 way, 4 way
7. Surface, S1, S3, and S4
8. Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
9. Surface, snap, electrolier
10. Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required

TACKS — double-pointed No. 10

TAPE
1. Friction, ½-lb. rolls
2. Rubber, ½-lb. rolls

TELEGRAPH SETS — including sounders, keys, and relays

TELEPHONES
1. Complete bridging, independent phones

(Continued on page 42A)

SPECIFY Hotpack EQUIPMENT

BUILT for ACCURACY — AND LONG SERVICE

ELECTRIC HEAT TREATING FURNACE

No. 7077

For Hardening, drawing, tempering and annealing or normalizing of dies, punches, gages, fixtures or other parts are performed readily with these redesigned Hotpack Electric Box Furnaces.

This new Hotpack Electric Furnace is fast heat-built for continuous use from 300° F. to 2000° F. It is the only Furnace equipped with Automatic Controlling Indicating Pyrometer and also with Limistat control in this price field.

SPECIFICATIONS

Model	Interior Size W.D.H.	Current Characteristics	Prices F.O.B. Phila.
7076	8"x 8"x 5½"	110 V AC 15 Amp.	$265.00
7074	8"x 8"x11"	115 V AC 15 Amp.	295.00
7075	12"x12"x11"	230 V AC 23 Amp.	430.00
7077	15"x16"x16½"	200 V AC 30 Amp.	640.00
7079	12"x12"x 5½"	110 V AC 15 Amp.	305.00

PLASTIC PRE-HEATING ELECTRIC PORTABLE OVEN

For preheating Methyl Methacrylate in sheet or rod form where it is necessary to maintain oven temperature throughout the sheet especially desirable in compressed air, vacuum or pressure forming techniques.

The Oven is controlled by a newly developed thermostatic control, sealed in and conveniently placed on the front panel, of the Oven. It can accurately be set at any desired temperature where a quick rate of heat up to 300° F. is desired.

Due to the Aluminum Construction, the Oven is very light in weight and can be carried from the room or project to project. As it operates on 110 volt AC or DC, it can be plugged into any 110 volt receptacle.

No. 600

SPECIFICATIONS

Model	Interior Size	Wattage 110 AC-DC	F.O.B. Phila. Price
600	12"Wx12"Dx12"H	700	$ 90.00
602	24"Wx12"Dx12"H	1400	145.00

Hotpack KILN KIT

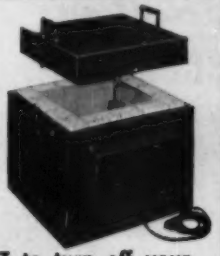
EVERYTHING YOU NEED TO MAKE THIS PROFESSIONAL LOOKING ELECTRIC KILN

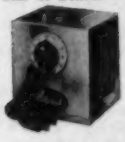
Large Chamber: 12" wide, 11" deep, 9" high

YOU GET: Illustrated Instruction Manual, Insulating Back Up Material, Insulated Cover & Handle, Wire — Screws — Terminal Board, Insulating Brick — cut to size, Sheet Metal Case — welded & painted, Hotpack Heating Elements, wired, 15 amps — 115 volts — Ready to install.

Prices Including Freight and Crating:

East of Denver — $52.00 West of Denver — $60.00





YOU NEVER FORGET to turn off your kiln with the

HOTPACK LIMITOR

Plug-in Type, 115 v., $14.95 Wire-in Type, 220 v., $27.95

Hotpack ELECTRIC CERAMIC KILNS

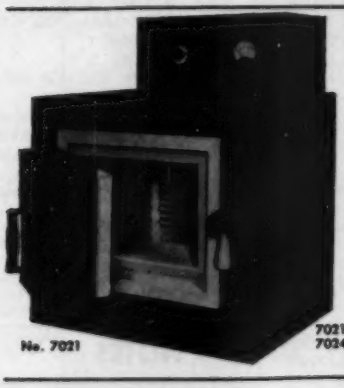
No. 7004

1. Eye level controls — pilot light. 2. Built-in pyrometer for visible accurate temperature indication. 3. Handles are cool to touch. 4. Control switch — low, medium, and high heat for even distribution. 5. Special insulation holds heat and prevents scorching of table top. 6. Maximum temperature 2050° F.

SPECIFICATIONS

Model No.	Interior Size	Shelves Furnished	Approx. Time	Price F.O.B. Phila.
7006	8"x 8"x 5½"	1	3 hrs.	$ 85.00
7004	8"x 8"x11"	2	4 hrs.	115.00
7005	12"x12"x11"	2	3 hrs.	250.00
7007	15"x16"x16½"	3	4 hrs.	480.00
7009	12"x12" 5½"	1	4 hrs.	125.00

Enameling on copper can be efficiently fired on our models No. 7006 and 7009.



No. 7021

HEAVY DUTY NEW HIGH TEMP. KILN

Temperature to 2350° F.

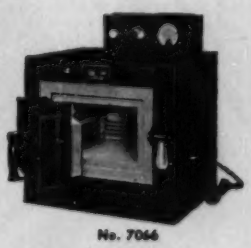
Fast come-up time 5 hrs. to 2300° F. 7" of insulation, including interlocked 2500° F. brick. Controls grouped in eye-level panel, recessed with special plexiglas cover to prevent unauthorized adjustment while in operation. Many other features.

SPECIFICATIONS

	Interior Size	Watts	Price F.O.B. Phila.
7021	10"x 9½"x 9"	28KW	$ 225.00
7024	19"x18½"x18" 230 volts		$1080.00

CONTR. TEMP. KILN FOR ENAMELING ON COPPER

These units provide manual adjustment of temperature for kilns. They may be regulated so that current may be supplied to the kiln for any percentage of time per minute. This method of selection provides exact temperature because the slightest movement of the control knob will vary the time of input, thereby raising or lowering the temperature as desired.



No. 7066

SPECIFICATIONS

Model	Interior Size	Price F.O.B. Phila.
7069	12"x12"x5½"	$179.00
7066	8"x 8"x5½"	137.00

NEW IMPROVED METAL ENAMELING KILN

Fast come-up time, 60 minutes to 1500° F. Uniform heating from floor refractory; high grade coiled heating elements. Unique front door opening prevents heat loss, eliminating possibility of dangerous accidents. Many other features.

SPECIFICATIONS

Model	Interior Size	Watts
7032	5½"x 6"x5"	115 V 10 Amp. Price F.O.B. Phila. $45.00
7033	12"x12"x5"	115 V 17 Amp. $85.00
7034	11"x18"x5"	230 V 12 Amp. $133.00

No. 7033

WRITE FOR COMPLETE DETAILS — SEND FOR CATALOG

No. 15

ELECTRIC PLASTIHEETER

Designed for Use in Plastic Courses in the School — a commercial type strip heater designed to heat sheets of Plexiglass or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ⅛" thickness in from 30 seconds to 4 minutes depending on the thickness of the contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.

SPECIFICATIONS

No.	Working Space	Overall Size	Wattage 115 Volt	Shipping Weight	F.O.B. Phila.
15	18"Lx5"Wx2½"H	21"Lx7"Wx3½"H	200 W	4 lbs.	$22.50
16	30"Lx5"Wx2½"H	32"Lx7"Wx3½"H	350 W	6 lbs.	35.00

THE ELECTRIC Hotpack COMPANY, INC.

5067 COTTMAN AVENUE • PHILADELPHIA 35, PA.

(Continued from page 40A)

2. Couch vestibule telephones
3. Receivers, transmitters, induction coils, condensers, and bridging switch hooks

TRANSFORMERS
1. Bell ringing, 6, 8, 14 volt
2. Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 5/16 by 10 in.

TUBING — flexible nonmetallic, 1/4 and 3/4 in.

WASHERS
1. Iron, 1/4 and 3/8 in.
2. Brass, 1/4 and 3/8 in.

WIRE
1. Annunciator, No. 18 or No. 20
2. Fixture, No. 18, single yellow, with marker
3. Rubber covered, solid copper, No. 10, black
4. No. 10, white
5. No. 14, black
6. No. 14, white
7. Rubber covered, No. 16, brewery cord
8. No. 18, lamp cord, green and yellow
9. S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equipment

ANNUNCIATORS
1. Automatic needle drop
2. Gravity drop
3. Manual needle drop

ARMATURES — burnt out, for repairing

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
1. Air, single pole, overload, 25 amp., 550 volt
2. Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
1. For multiple-speed motor
2. For 1 h.p., 110-volt series

GENERATORS
1. Motor-generator set, 10 h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
2. Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
3. Auto generators of different makes

GRAVITY CELLS

MAGNETS — testing, 10,000 ohm

METERS
1. Ammeter, standard, 60 amp., a.c.
2. Ammeter, standard, 60 amp., d.c.
3. Ammeter, student, 60 amp., a.c.
4. Ammeter, student, 60 amp., d.c.
5. Voltmeter, standard, 0–10 volt, d.c.-a.c.
6. Voltmeter, standard, 110–220
7. Voltmeter, standard, 125 volt
8. Voltmeter, standard, 125 volt, d.c.
9. Voltmeter, student, 110 volt, d.c.
10. Voltmeter, student, 110 volt, a.c.
11. Wattmeter, standard, 110–220 volt, 30-60 amp., d.c.-a.c.
12. Wattmeter, student, 110–220 volt, 30 amp., a.c.-d.c.
13. Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
1. Auto starter, different makes
2. Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
3. Compound, 1 h.p., 110 volt, d.c.
4. Multiple speed, 1 h.p., 3 phase, 220 volt
5. Series, 1 h.p., 110 volt, d.c.
6. Shunt, 1 h.p., 110 volt, d.c.
7. Split phase and repulsion, a.c., 110 volt, single phase, assorted
8. Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
9. 3 phase, 1 h.p., a.c., 220 volt, various makes
10. 3 phase, 2 h.p., 220 volt, a.c., various makes
11. Universal, fractional h.p., 110 volt, different makes
12. Universal, variable speed, 1/2 h.p.

PLATFORM SCALE — 110 lb. capacity

PUSH BUTTON *Speed Selection*
from to in seconds
or to *any* intermediate speed, *instantly*

Teach modern methods with these strictly modern lathes that eliminate all hand belt shifting and deliver even the new high speeds with the touch of a button.

It's that easy!

The work is done by a motor driven speed changer. It accelerates or slows the lathe to any desired speed in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds—200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe moderate in price with the versatility for safely teaching both beginning and advanced students.

SHELDON *Variable Speed* PRECISION LATHES

Illustrated WM56P
13" Swing- 34" Centers
Base Price F.O.B. Factory
$2146.00
Less Chip Pan and Electricals
Also available with 11" Swing

Write for
"Variable Speed" Circular and General Catalog showing . . .
•
10", 11", 13" and 15" SHELDON Precision Lathes (Bench, Pedestal and Cabinet types)
•
13" and 15" SEBASTIAN Geared Head Lathes
•
SHELDON Milling Machines
•
SHELDON Back Geared Shapers

Instructors: Write for Catalog and schedule of Sheldon Teaching Aids.

SHELDON MACHINE CO., INC.
4244 N. Knox Ave. • Chicago 41, ILL.

NEWS NOTES

(Continued from page 35A)

GUIDANCE CONFERENCE AT STOUT

Over 800 experts in various phases of guidance came to the campus of Stout State College, Menomonie, Wis., for a January all-day guidance conference — the largest such group ever to attend a conference of this type at the college.

Participating were guidance specialists, school administrators, psychiatrists, public officials, and other personnel with guidance responsibilities.

Following a welcome by Dr. Verne C. Fryklund, president of Stout, and R. W. Whinfield, secretary of the Wisconsin Personnel and Guidance association, conference participants heard the keynote address, "Guidance for the

(Continued on page 53A)

Practical and proven programs for better electronics education . . .

PHILCO ELECTRONICS TRAINING PACKAGES

Philco Electronics Training Packages for High Schools employ proven methods to make teaching easier and give students a better understanding of electronics theory and applications.

The unique Philco Electronics Classroom Demonstrator presents the circuits of electronics theory a step at a time with easily learned "building block" panels.

Classroom demonstrations, laboratory experiments and tests are completely organized for the teacher in the instructor's manual . . . and all are correlated with the text book.

A variety of packages is offered. Any High School, Academic or Vocational, can select a course to suit specific educational objectives.

THE PHILCO ELECTRONICS CONSOLE DEMONSTRATOR PRESENTS THE CIRCUITS OF ELECTRONICS THEORY AND EQUIPMENT A STEP AT A TIME WITH EASILY LEARNED "BUILDING BLOCK" PANELS.

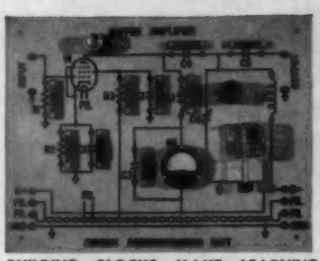
Each basic electronics circuit is separated and presented in its most widely used form for easy learning. As students learn each circuit, that "building block" (circuit) is added to the rack on the console.

Complete and functioning systems from a simple radio to a complex industrial electronics system are built a circuit at a time on the classroom demonstrator.

All demonstrations are explained in the instructor's manual . . . and all are correlated with the text book, lab experiments and work books.

Contained within the cabinet base are as many as 40 "building block" panels, depending upon the package selected. The entire console unit moves easily on its own casters and plugs into any regular A.C. outlet.

Write today for free descriptive booklet.



BUILDING BLOCKS MAKE LEARNING EASIER. Each is a basic circuit . . . function and relationship to entire system are easily explained as it is added on demonstrator.

MATCHING LAB CHASSIS. For each "building block", there is a matching lab chassis, a complete and operating counterpart unit for laboratory experimentation.

STUDENTS LEARN BY DOING. Using the laboratory chassis, students can duplicate the systems presented by the instructor on the console demonstrator. Test techniques can also be taught. A complete kit of defective components is supplied for actual trouble-shooting.

PHILCO TECHREP Division

22nd and Lehigh Avenue **Philadelphia 32, Pennsylvania**

(For more information from advertisers, use the postcard on page 91A)

AMERICAN TECH

Publishers since 1898...

The complete working vocabulary of electricity and electronics brought together at last in a single, compact volume!

The PRACTICAL Dictionary of ELECTRICITY and ELECTRONICS

R. L. Oldfield

(Includes handbook)

Here is complete information on terminology employed in the many branches of today's ever-expanding electricity and electronics industry.

Covers everything your students will need, from explanations of fundamental principles to complete information on new fields, new processes, and new equipment.

No wading through abstract tomes to find what you need. Here are practical, time-saving definitions available at your fingertips.

Over 200 photographs, drawings, charts, and diagrams have been skillfully selected to supplement verbal explanations.

215 pages. List price $5.95

And you'll want to see —

1. **Electricity and Electronics-Basic** *Steinberg-Ford $4.50*
2. **Radio-Television & Basic Electronics** *Oldfield $4.95*
3. **Fundamentals of Electricity** *Graham-McDougal $3.50*
4. **Interior Electrical Wiring and Estimating, Part II — Industrial** *Graham $5.95*

Send for on approval copies!

American Technical Society

Dept. W355

848 E. 58th St., Chicago 37, Ill.

Please send me on approval copies of books checked below. After as long as 30 days of leisurely examination, I agree to either return them, or make remittance — less eductors' discount.

☐ The Practical Dictionary

☐ Books encircled below:

1 2 3 4

Name.....

Subject/Position.....

School.....

Address.....

City.....Zone...State.....

AUTOMOTIVE EQUIPMENT

(Continued from page 38A)

CALIPERS
1. 6" — inside spring nut release, screw thread adjustment. High grade spring steel
2. 6" — O.D. spring nut release, screw thread adjustment. High grade spring steel

CARBURETOR TOOL KIT
Complete set of overhaul tools for popular makes of carburetors

CHISELS
1. Cape ¼" — 6" length forged tool steel
2. Cold ½" — 6" length forged tool steel
3. Diamond point ¼" — 6" length forged tool steel

DIES (for economy, purchase taps and die in sets)
1. Machine screw — 6-32NC, 6-40 NF, 8-32NC, 8-36NF, 10-24NC, 10-32NF, 12-24NC, 12-28NF
2. National standard — adjustable round split dies forming American standard thread 7/16" thickness, 1 5/16" outside dia. high quality alloy: ¼"-20NC, 5/16"-18NC, ⅜"-16NC, 7/16"-14NC, ½"-13NC, 9/16"-12NC, ⅝"-11NC, ¾"-10NC, ¼"-28NF, 5/16"-24NF, ⅜"-24NF, 7/16"-20NF, ½"-20NF, 9/16"-18NF, ⅝"-18NF, ¾"-16NF
3. Die stock machine screw — to hold 13/16" O.D. round adjustable machine screw die
4. Die stock, national standard — to hold 7/16" thick, 1 5/16" O.D. national standard die

DIVIDERS
6" stiff spring tapered spool, high quality spring steel legs with replaceable needle-points

DRILL STAND — fractional 1/16" to ½"

DRILL, ELECTRIC (*see* Special Equipment Section)

FILE CARD
Steel back frame and face. Tempered steel wire bristles, complete with steel tapered pick

FLARING TOOL
3/16" to ⅝" O.D. tubing size

GAUGES
1. Shoe and drum gauge — leaf type shim gauge for testing brake shoe and drum clearances
2. Tire gauge, standard tire pressure gauge. 0-60 lb. capacity
3. Screw pitch gauge, 60°V type thread. 22 pitches, 32 to 74
4. Thickness gauge, 2 5/16" length blade, 22 blades .004" to .025" tempered and encased
5. Thickness gauge, 6" blade, 8 tapered leaves, .002, .003, .004, .006, .008, .010, .012, and .015 leaves

HAMMERS
1. Machinist — 12 oz. ball peen, forged steel, heat treated and polished, wooden handle
2. Machinist — 24 oz. ball peen, forged steel, heat treated, wooden handle
3. Claw hammer, adze eye, curved claw. bell shaped head. Wooden handle, forged head
4. Sledge — 7 lb. bell face, adze eye, forged hardened and tempered steel. Wooden handle
5. Soft faced head, wooden handle

KNIFE, PUTTY
1¼" wide 3½" long, tempered polished elastic steel

MICROMETERS
1. Inside diameter — calibrated to .001". range 2"-9½", calibrated thimble with ground steel extension rods. Angular grooved extensions for quick adjustment

WATCH YOUR AUTOMOTIVE STUDENTS LEARN FASTER WITH THIS

Step-by-Step Picture Guide to Car Service and Repair

Puts the "Meat" of 176 Official Shop Manuals Right at Your Students' Fingertips

MOTOR'S brand-new 1959 Auto Repair manual will make your job a lot simpler. It shows your students exactly how to locate troubles, where to start a job, what tools to use... how to do everything from a simple brake adjustment to a complete overhaul.

Most Popular Car-Repair Book in the World — Three Million Copies Sold

This giant book shows factory-approved procedures for repairing and servicing over 600 models — every popular make, 1952 through 1959. 1,120 giant, crystal-clear pages, 2,900 can't-go-wrong pictures, 291 quick-check charts, 23,000 essential repair specifications, 225,000 service-repair facts. Step-by-step guidance on: Engines, Automatic Transmissions, Air Suspensions, Ignitions, Fuel Pumps, Steering Gears, Brakes, Generators, Distributors, Power Brakes & Steering, etc., etc. PLUS TROUBLE SHOOTING SECTION showing how to spot 2,300 car troubles fast! Used by U.S. Armed Forces, mechanics, schools.

Double Offer for Teachers Only

1. Try Manual for *full week* FREE in your own classes. If you keep it. . . .
2. take the 25% special school discount off regular price. Otherwise, return book and owe nothing. Mail certificate — without money — to:

Motor Book Dept., Desk 9393, 250 W. 55th St., New York 19, N. Y.

Same FREE-TRIAL On These Manuals

Motor's Truck Repair Manual. Details 2,000 truck models since 1952. 300,000 service, repair facts, 2,000 illus. Everything students need to make truck repair simple. Over 800 giant pages.

Motor's Auto Engines & Electrical Systems. Basic knowledge students need to understand modern engines: valves pistons, bearings, fuel, cooling, elec. systems. 800 pgs., 1300 illus.

25% DISCOUNT CERTIFICATE

MOTOR — Book Dept., Desk 9393, 250 West 55th St., New York 19, N. Y.

Send me for 7 days' FREE TRIAL ..... copies of Motor's New 1959 Auto Repair Manual; ..... copies of Motor's New Truck Repair Manual; ..... copies of Motor's New Auto Engines.

If satisfied, I will remit special 25% Discount price of only $5.96 (plus postage) for Auto Repair Manual (reg. $7.95); only $4.88 (plus postage) for Engines & Elec. Systems (reg. $6.50); only $6.75 (plus postage) for Truck Repair Manual (reg. $9.00). Otherwise I will return book(s) within 7 days and owe nothing.

Name.....

School.....

Street.....

City.....Zone....State.....

(For more information from advertisers, use the postcard on page 91A)

2. Outside diameter — drop forged "I" section frame. Anvil, spindle, and barrel high quality, ground steel. Standard calibrations. Size 0–1", 1–2", 2–3", 3–4" (4 sizes)

OILER
5 oz., 3" spout, steel can, tempered steel bottom

OIL STONE
4" x 1¾" x ½" medium, complete in wooden case

OIL MEASURE
2 qt. heavy gauge galvanized steel combination measure, funnel and spout. All seams soldered

PISTON RING INSERTER SET
Spring steel strap type with a "T" handle adjusting device

PLIERS
1. 5" — flat nose, cross-checked, spring tempered nose, forged tool steel
2. 7" — long tapered flat nose, cap joint forged, tempered crestalog steel or equal
3. 8" — combination slip joint, forged tool steel
4. 7" — diagonal cutter mechanic's pliers, forged heat treated high grade tool steel

PUNCHES
1. Drive pin, 8" knurled hardened steel, set of 8: 1/16" dia. to 5/16" dia.
2. Center, ¼" x 4", forged alloy steel hammer tested, knurled handle

RIVET SET
Hand type for button head rivets

RULE, STEEL
12" x 1" width stainless steel, tempered, graduated in 1/8", 1/16", 1/32", 1/64"

SAW, HAND HACK
8" — 12" adjustable frame, 2¾" throat, pistol grip

SCREW DRIVERS
1. 3" — carbon steel blade, wooden handle pinned to blade
2. 6" — carbon steel blade, 5/16" dia. wooden handle pinned to blade
3. 9½" — square drop forged steel blade, perfect handle grip riveted to blade
4. 6" — carbon steel blade, 3/16" dia. tough plastic molded handle
5. Offset at both ends, forged and tempered tool steel, set of 6 for 3/16" to ¼"
6. Phillips head screw driver, alloy steel tempered deep fluted blade. Set of 4 to fit points Nos. 1, 2, 3, and 4
7. Clutch head screw driver, alloy steel tempered. Set of 4, Nos. 1, 2, 3, and 4

SCREW EXTRACTOR
Straight shank, deep fluted blade, hardened tool steel, set of six

SCRIBER
⅛" dia. 10" double point hardened tool steel

SNIPS, TIN
1. Straight — 3" drop-forged hardened tool steel, straight blade ground and polished
2. Curved — 3" drop-forged, hardened tool steel

SOLDERING IRON, ELECTRIC
½" electric soldering copper, 200 watt complete with cord, tip and stand

SQUARE, COMBINATION
Tempered 12" blade with forged square, center, protractor heads

STAMPS, STEEL
1. 3/16" hand cut figures 1 to 0
2. 3/16" hand cut letters A to Z

TAPS (for economy purchase taps and dies in sets)
1. Machine screw taps — hand tap, plug type, straight fluted, high quality, carbon steel fine ground thread; 1-set: 6–32NC, 6–40NF, 8–32NC, 8–36NF, 10–24NC, 10–32NF, 12–24NC, 12–28NF

(Continued on page 56A)

SHOCKPROOF! NOISELESS!

IDEAL FOR CLASSROOMS... SAFE—SILENT

Marquette's new 90 Series Welder is best for classrooms because it is shockproof, noiseless and makes arc striking easier. Why? The welder is enclosed in tough, durable fibre-glass which is *non-conductive!* The "Perma-Shield" cabinet eliminates eddy current losses, noisy vibrations and shock-danger. This new welder is ten per cent more efficient and provides improved arc striking characteristics... advantages that teachers and students alike will welcome.

That's not all! The fibre-glass cabinet is rustproof, colorproof, waterproof and moisture proof. It's stronger than steel but lighter in weight and practically indestructible. The entire welder is best for training purposes because it's easier to operate (heat taps are clearly marked and safe, positive and easy to select), it's built to last longer and it will always keep its new appearance.

Two sizes in four models are available. One delivers a maximum of 200 amperes; the other, 275 amperes and each is available capacitor equipped, for increased power factor.

WHAT DOES ANODIZED ALUMINUM MEAN TO WELDING TORCHES?

It's new and Marquette's got it! Oxy-acetylene welding torches made of *anodized aluminum* make them 50 per cent stronger and 50 per cent lighter. Precision made, they're practically unbreakable and will stand years of rough handling. Makes them perfect for training schools. Eliminates factory service because they're equipped with fast change O-ring seals. Simply replace worn seals with new ones and the torch is ready for action in minutes time. Three models (Aero-Jet, Star-Jet and Super-Jet) are available for welding and cutting all thicknesses of metal.

WHAT KIND OF ROD DO YOU WANT?

Marquette makes a welding electrode or gas rod for every welding application. From its famous No. 130 Red Rod for getting deep penetration in dirty, rusty metal to its No. 15 Presto-Arc rod for high speed welding of sheet metal, Marquette offers the best for any shop. This range of rods includes high tensile, hard surfacing, cast iron, special alloys and bronze rods.

WRITE FOR THESE FREE FACT-PACKED BULLETINS

1 The 90 Series Arc Welder
2 Jet Series Welding Torches
3 Guide to Better Welding

When it Comes to Welding Come to

MARQUETTE
WELDING EQUIPMENT

Marquette Manufacturing Company, Inc., 307 East Hennepin Avenue

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
1. Coke
2. Foundry
3. Scrap
BENDER — For bending bar, flat metals, and tubing.
Accessories for benders
Stand for bender
BELT LACER
BENCHES
1. Coremaking
2. For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¼ in. to 2½ in. thick
3. Molding
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BRAKES — Box and pan
Stand for brake
BULLETIN BOARD
CABINETS — wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — teachers', and tablet arm if needed for related-subjects room, or for demonstration section
CHALKBOARDS — permanent or portable
CHUCK
1. Drill, selected sizes
2. Lathe, combination, 4 jaw, selected sizes
3. Lathe, independent, 4 jaw, selected sizes
4. Lathe, universal, 3 jaw, selected sizes
5. Milling machine, universal
CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand; of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
1. Bench, hand
2. Breast
3. Electric, portable
4. Hand
5. Post, hand or power
6. Radial
7. Sensitive
8. Upright, power
FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
1. Annealing
2. Bench
3. Brass and soft metal
4. Combination bench
5. Casehardening
6. Cyanide
7. Gasoline
8. Heat-treating
9. Melting
GEAR-CUTTING MACHINE
GRINDER
1. Bench, hand or power driven
2. Combination grinder, buffer, and polisher
3. Emery, bench or pedestal type
4. Face, with magnetic chuck
5. Portable tool post
6. Precision, for external and internal grinding
7. Universal tool cutter, drill and reamer grinder
8. Wet tool
HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola, 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
1. Automatic
2. Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
3. Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
4. Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
5. Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
6. Turret
7. Metal spinning
MILLING MACHINE
1. Plain, cone or motor-driven type
2. Universal, cone or motor-driven type
NIBBLING MACHINE
NOTCHER — Capacity, 16 mild steel; 90 degree notch (maximum 6 by 6 in.)
Stand for notcher
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PRESS — For stretch forming, free blowing, blow molding, and vacuum forming thermoplastic sheet materials.
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
ROLLERS — 16″, 18″, 24″, 30″, and 36-in. forming width; for 16″, 18″, 20″, and 22-gauge mild steel capacity respectively
Stand for rollers
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
1. Counter for machine shop
2. Platform, for foundry, 1000-lb. capacity
SHAPER
SHEARS — Capacity, 16-gauge mild steel; shearing width 6, 9, 12, and 24-in.
Stand for shears
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
1. Blacksmith
2. Drill press
3. Machinist
4. Pipe
5. Planer
6. Shaper
WELDING OUTFIT
1. Acetylene
2. Electric

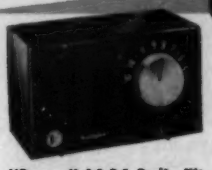
Metalworking — Small Tools

ARBORS
1. Drill chuck to suit requirements
2. Reamers, various sizes
3. Shell tool, various sizes
4. Straight shank for shell reamers and shell drills, selected sizes
5. Taper shank for shell reamers and shell drills, selected sizes
BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
1. Bench
2. Core box
3. Core painting
4. Hard brushes for foundry
5. Floor
6. Soft brushes for foundry
BULB SPONGES — for molders
CAKE FORKS — for foundry
CALIPERS
1. Hermaphrodite, 4 in. and 6 in.
2. Inside, 4 in. and 6 in.
3. Outside, 4 in. and 6 in.
CANS
1. Oil, ½ pt., 1 pt., and 10 gal.
2. Waste
CENTER TESTERS
CHISELS
1. Cape, 3/8 and 5/8 in.
2. Cold, 5/8 and 3/4 in.
3. Diamond point, 3/4 and 1/2 in.
4. Roundnose, 3/8 and 1/2 in.
CLAMPS
1. 4, 6, 8, and 10 in.
2. Flask, for foundry
3. Strap, various sizes
COLLETS
1. For milling machine, selected sizes
2. For lathe, selected sizes
COMBINATION SQUARES — with hardened head and blade, and protractor head, 9 and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
1. Shanks, single end to fit ladles
2. Shanks, hand, to fit ladles
CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal splitting
DIVIDERS — spring, 4 and 6 in.
DRAW PINS — for molders
DRILLS
1. Drifts, different sizes
2. Sleeves, different sizes
3. Stand for Nos. 1 to 60
4. Stand for 1/16 to 1/2 in. by 64ths
DRILLS
1. Center
2. High speed, taper shank, various sizes
3. Jobbers, straight shank, 1/16 to 1/2 in. by 64ths
4. Ratchet
5. Straight shank, Nos. 1 to 60
6. Taper shank, 1/2 to 1 in. by 16ths
FILE CARDS
FILES
1. Die sinkers, various shapes
2. Flat bastard, 8, 10, 12, and 14 in.
3. Half round, double cut, 6, 8, 10, and 12 in.
4. Hand, smooth, 8, 10, and 12 in.
5. Mill, smooth, 8, 10, and 12 in.
6. Round bastard, 8 and 10 in.
7. Square bastard, 8 and 10 in.
8. Swiss, various shapes
9. Three-square, double cut, 6 in.
10. Warding, double cut, 6 in.
FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple for foundry
GAUGES
1. Center
2. Depth
3. Drill and wire
4. Screw pitch, select kinds

(Continued on page 48A)

Best for Training in Electronics

knight-kits
an ALLIED RADIO product



"Ranger" AC-DC Radio Kit
Popular 5-tube superhet radio project. Thousands used in shop training. Teaches radio construction. Complete with cabinet.
83Y736. Only.....**$16.95**

"Space-Spanner" Receiver Kit
Exciting school project; tunes world-wide short wave as well as broadcast. Packed with interesting features.
83Y259. Only.....**$18.95**

See our catalog for many other fine Knight-Kits

12-in-One Electronic Lab Kit
Widely used by schools for instruction in electronics. Performs 12 separate experiments with only a simple wiring change required for each project (components, once mounted, need not be disassembled). Projects are: receiver, amplifier, "broadcaster", code oscillator, flasher, timer, transmitter, electronic relays, etc. With all parts, including relay, photocell, microphone. Shpg. wt., 3½ lbs.
83Y272. Only.....**$14.95**

FREE ALLIED'S 452-PAGE **1959 CATALOG**
Offers everything in electronics for the school: Knight-Kits for training; sound and recording equipment; lab instruments, tools, books, electronic parts. Write for FREE copy today.

ALLIED RADIO
100 N. Western Ave., Dept. 51-C9
Chicago 80, Ill.

WATCHEMOKET eye SAVERS

Model 440SV

Soft Vinyl
COVER GOGGLES
FOR 100% EYE PROTECTION

For Heavy Impact. Replaceable, optically correct, methacrylate lenses in choice of clear, green or black frame. Clear Lens is .125" thick; Light and medium green lenses .100" thick; dark green lenses .080" thick.

Stac-Vent Ventilation keeps the goggles fog free. Also available with Regular, Screen Ventilation or No Ventilation.

Soft Vinyl Frame form-fits the contours of the face and nose... closes the gaps around nose and cheek... more protection... more comfort.

Large frame fits over any prescription spectacle... easy to adjust... comfortable to wear.

WRITE FOR FULL INFORMATION
WATCHEMOKET OPTICAL CO., INC.
232 West Exchange St., Providence, R. I.
In Canada: Levitt-Safety Limited, Toronto 10, Montreal 26, Winnipeg

NOW AVAILABLE!
Introducing the first coordinated Industrial Arts Electricity—Electronics Course

BASED ON ACTUAL SURVEY OF

WHAT THE INSTRUCTORS WANTED

"Industrial Arts: Beginning Electricity—Electronics—Model 30"

This revolutionary new Crow Course is the result of our survey of 40 state school heads to determine a wholly new teaching method for electricity and electronics.

Our Crow course, "Industrial Arts: Beginning Electricity—Electronics—Model 30" is composed of 10 basic units which are complete coordinated packages of teaching materials (not just teaching manuals and student manuals). It provides such time-saving benefits as: teacher's shop progress chart; pupil's self-testing and evaluation; comprehensive, objective final examination and teacher's source of materials.

The new course is flexible to purchase and to use. Each unit is self-contained yet may be combined for various length courses. All 10 are adaptable for short or one-semester courses. Units can be easily used for either the unit or general shop plan teaching.

THE COURSE'S AUTHOR...
William A. Kavanaugh, B.S., M.S. PhD
Assistant Professor of Electricity—Radio Electronics, University of Minnesota

Dr. Kavanaugh's education in the field of Electricity, Radar, Electronics and related sciences has spanned nearly a quarter of a century. He has been a distinguished teacher of high school, college and adult classes for fourteen years. His contributions to the teaching profession have long been admired, and his abilities have earned him nationwide prominence in the Industrial Arts field.

"INDUSTRIAL ARTS: BEGINNING ELECTRICITY—ELECTRONICS, MODEL 30" INCLUDES:

Unit 1: "The Electric Circuit"
Unit 2: "Electricity and Magnetism"
Unit 3: "Direct Current Circuitry"
Unit 4: "Chemistry and Electricity"
Unit 5: "Motors and Generators"
Unit 6: "Alternating Current"
Unit 7: "Home Wiring and Electric Circuits"
Unit 8: "Automotive Electricity"
Unit 9: "Alternating Current Circuitry"
Unit 10: "Electricity and Communications"

Course Now Available! Write Today!

CROW
UNIVERSAL SCIENTIFIC COMPANY, INC.
BOX 336 IA — VINCENNES, INDIANA

(For more information from advertisers, use the postcard on page 91A)

(Continued from page 46A)

5. Surface
6. Thickness

GLOVES — asbestos, for foundry

GOGGLES
1. For machine shop 2. For foundry

HACK SAW
1. Blades, hand, 18T, 10 in.
2. Blades, power, 14T, 12 in.
3. Frames, adjustable

HAMMERS
1. Babbitt
2. Ball peen, 13, 16, or 20 oz.
3. Blacksmith's, various kinds
4. Riveting, 9 and 12 oz.
5. Setting

INDICATOR
1. Center
2. Universal or universal dial test
3. Speed

KNURLING TOOL — with assorted knurls

LADLES
1. Bull 2. Hand bowls 3. Melting

LATHE DOGS — ½, ¾, 1, 1½, 2, 2½, and 3 in.

LEGGINGS — fireproofed duck, to protect students when pouring in foundry

LEVEL — 6-in. bench

LIFTING SCREWS — for molders

MALLETS — wood or soft

MANDRELS — selected sizes

MICROMETERS — inside, 1½ to 8 in.; outside, 0 to 1 in.; outside, 1 to 2 in.; outside, 2 to 3 in.

MOLDING BOARDS

MOLDING STICKS AND TROWELS — various kinds

NIPPERS — end cutting, 5 in.

OIL STORAGE TANK — with pump

OILSTONES — medium and fine

PAILS — galvanized, 12-qt. capacity for foundry

PARALLELS
1. Adjustable 2. Steel, assorted sizes

PLIERS
1. Combination, 6 in.
2. Side-cutting, 6 in.

PUNCHES
1. Center, ¼ and ⅜ in.
2. Hollow, ½, ¾, and 1 in.
3. Pin, ⅛, 5/32, 3/16, 7/32, and ¼ in.
4. Prick, ¼ in.

RAMMERS — for foundry
1. Hand 2. Floor
3. Taper pin 4. With taper shank

REAMERS — various sizes
1. Adjustable
2. Hand

RIDDLES — ¼- and ⅛-in. mesh, 18-in. diameter, for foundry

RIVET SETS — assorted sizes

SCALES
1. Steel, 6 in., graduated 1/64 to ½ in.
2. Steel, 12 in., graduated to 32nds

SCREW DRIVER — 6 and 9 in. blade

SCRIBERS

SHOVELS
1. Coke 2. Sand

SNIPS — tin, 3 in. straight and 3 in. curved

SOCKETS — for taper shanks, drills and tools, selected sizes

SOLDERING COPPERS AND HANDLES — 1-lb. size

SPRAY CAN — for molders

SPRINKLING CANS — galvanized iron, 16-qt. capacity, for foundry

SPRUE PICKS — for molders

SQUARES
1. Machinist's, 6 in. 2. Blacksmith's

STEEL FIGURES — ⅛ in.

STEEL LETTERS — ⅛ in.

SWABS — for molders

TAPELINE — steel, 25 ft.

TAPS AND DIES
1. Machine screws 3. N.F. ¼ to ¾ in.
2. Pipe 4. N.C. ¼ to ¾ in.

TONGS
1. Blacksmith's, various kinds
2. Pick up, for foundry
3. Shake out, for foundry

TOOL HOLDERS
1. Boring tools
2. Cutting-off tools
3. Planer
4. R.H. and L.H. offset shank
5. Shaper 7. Straight shank
6. Slotter 8. Threading

TOOL HOLDER BITS — square, ¼, 5/16, ⅜, 7/16, and ½ in.

TRAMMEL POINTS

V BLOCKS AND CLAMPS

WHEEL DRESSER

WRENCHES
1. Adjustable, 8 and 10 in.
2. Pipe, 8 and 12 in.
3. Tape, adjustable, various sizes

PRACTICALLY EVERY PRINTING PLANT IN THE WORLD USES ONE OR MORE OF THESE
Rouse PRODUCTS
For absolute accuracy and extra profits, order Rouse time-saving equipment. Write for complete illustrated catalog—today!
No. 2 Band Saw
Slug Clippers
No. 40 Lead and Rule Cutter
Register Quoins
Hand Miterer
Economy Vertical Miterer
Composing Stick
Make-Up Rule
Line Gauge
Sonnett Positive Assembler
Newspaper Wall File
Line Slug Cutter
Type Mortiser
Tympan Paper Holder-Vertical or Horizontal
Form Truck
Press Seat
H. B. ROUSE AND COMPANY
50 YEARS OF SERVICE TO THE PRINTING INDUSTRY

Metalworking — Materials and Supplies

ABRASIVE CLOTH — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls

ABRASIVE WHEELS

ACETYLENE GAS — in drums for welding

ALUMINUM
1. Pigs for foundry
2. Sheets, tubing, rounds, shapes, wire, etc.

BABBITT METAL

BEARING BLUE

BELT DRESSING

BELT LACING MATERIAL

BELT LEATHER

BOLTS
1. Carriage, selected sizes
2. Lag, selected sizes
3. Machine, selected sizes
4. N.F., selected sizes
5. Stove, flat or roundheads, selected sizes

BRASS
1. Bars, 3/32, ⅛, 5/16, and ¼ in. thick; ⅜

(Continued on page 50A)

CONNECTICUT

Model U322

Only $165.00

UNIVERSAL BENCH BRAKE for school shops

A quality tool accurate and easy to operate. Versatility makes it ideal for training. Popular in commercial sheet metal shops for light production, box and pan work. Replaceable bronze bushings provide long machine life. Available in 3 and 4 ft. models, universal or plain. Write for Bulletin U 3221.

Rated Capacity: 16 flange on 22 gage mild steel, full brake length. Fingers of case hardened steel in widths of 2, 3 and 4 inches permit 3 inch box and pan depth. Other Prices of the Bench Series

4 ft. Universal, $220.00
3 ft. Plain, 114.50
4 ft. Plain, 134.50

All prices F.O.B. Old Saybrook, Conn.

W. WHITNEY STUECK, INC.
Old Saybrook, Conn.

Southern

SCREWS AND BOLTS CAN MAKE A BIG DIFFERENCE

in the quality and strength of your workshop projects.

Southern's wide variety of Phillips or slotted fasteners with accurate threads plus uniform strength offers easy application, tight holding power.

Teachers know that basically good instruction depends on the kind of methods used. They also know that sound classroom projects depend on quality fasteners. For quality fasteners, depend on Southern!

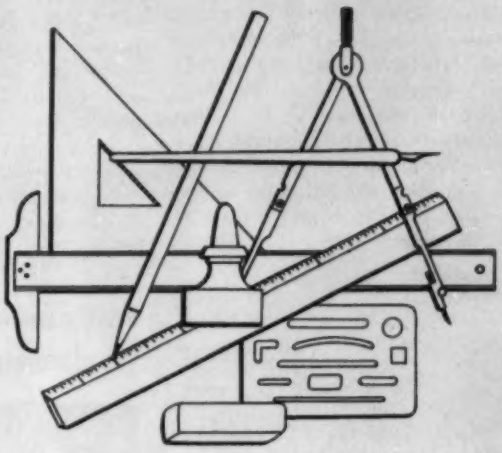
Sold Through Leading Hardware and Building Supply Dealers

Wood Screws • Tapping Screws • Machine Screws • Dowel Screws • Drive Screws • Stove Bolts • Carriage Bolts • Hanger Bolts

Introduction to

MECHANICAL DRAWING

By EARL W. HARMAN



Here is a completely modern mechanical drawing text for the Junior High School Level. Written especially for the 7th, 8th and 9th grade reading level, it can also be used successfully as a unit in general shop class, or as a supplementary text for any shop class where a basic knowledge of mechanical drawing is needed.

Special Features

- Numerous illustrations and original, meaningful cartoons showing the fundamentals of mechanical drawing
- Glossary of meaningful terms
- Spiral binding, allowing each required page to stay open and flat while in use.

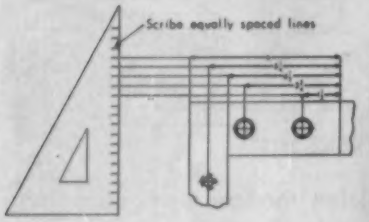
ALLYN and BACON, Inc.
Boston Englewood Cliffs, N. J. Chicago
Atlanta Dallas San Francisco

(For more information from advertisers, use the postcard on page 91A)

DRAFTING TIPS

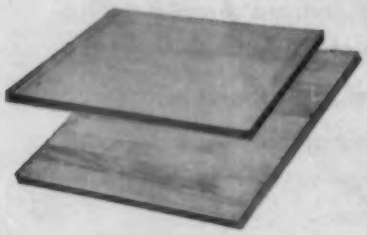
Drawing equally spaced dimension lines

Dimension lines can be equally spaced by scribing a triangle along any vertical side with equally spaced marks. Starting at the base dimension line, vertical witness lines are drawn to each succeeding mark up the scale. This leaves the ends of the witness lines spaced at equal intervals. Horizontal dimension lines are then drawn in by eye from the end of the witness lines, resulting in equally spaced dimension lines.



Important facts on drawing board construction

Through the years many types of woods and production techniques have been used in drawing board construction. These years of manufacture and research have shown that one wood, Basswood, has proved itself superior for use as drawing board stock. Basswood provides the necessary firmness, color, resiliency,



and dimensional stability needed to produce a sturdy, top quality product. Basswood is also economical enough to be well within a school's budgetary requirements. Because of these features POST uses choice stocks of Basswood in all its regular and metal edged drawing boards.

Electronic bonding of the Basswood strips provides stability and greater strength. The Basswood end cleats are joined by tongue-and-groove method and glue bonded for greater resistance to warpage. These advanced methods used in POST's own woodworking facilities permit the production of quality drawing boards for every purpose in every price range.

POST'S own specialized woodworking facilities

A complete line of fine products for drafting and engineering students is made at the POST plant in Owen, Wisconsin. This includes drawing boards, T-squares, scales, precision triangles, curves and many others. Great care is taken to meet POST's rigorous quality standards on each item produced.

For complete information on POST *drawing boards and other products, write the Educational Sales Division, Frederick Post Company, 3648 North Avondale Ave., Chicago 18, Illinois.*

POST

SENSITIZED PAPERS & CLOTHS • TRACING & DRAWING MEDIUMS • DRAWING INSTRUMENTS & SLIDE RULES
ENGINEERING EQUIPMENT & DRAFTING SUPPLIES • FIELD EQUIPMENT & DRAFTING FURNITURE

(Continued from page 48A)

to 1 in. wide, 8 to 10 ft. long, selected sizes
2. Round rods, 5/16 to 1/2 in. by 16ths, selected sizes
3. Sheets, 28 to 32 American gauge, 12 in. wide by 72 to 84 in. long, selected sizes
4. Strips, 1/32 and 1/16 in. thick, 1/2 to 1 1/4 in. wide, 50 ft. to a coil, selected sizes
5. Threaded rods, Nos. 6 to 10, in 24 in. lengths, Nos. 12, 14, 1/4, and 5/16 in., in 24 in. lengths, selected sizes
6. Wire, soft, 8, 11, and 14 American gauge, selected sizes
7. Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS
CHAPLETS — single and double head
COAL
1. Charcoal for foundry or forge
2. Coke for foundry 3. Forge

COPPER
1. Pigs, for casting alloys
2. Sheets, 8 to 25 American gauge, 30 by 60 in., selected sizes
3. Tubing, outside diameters, 3/16, 1/4, 5/16, 3/8, and 1/2 in.; thickness of wall, 1/32 in.; lengths, 8 to 12 ft., selected sizes
4. Wire, soft, 2 to 20 American gauge, in coils. Also in 1/4, 1/2, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

CORE
1. Compounds 4. Oil
2. Flour 5. Wax-vent wire
3. Paste

CUTTING COMPOUNDS
FIREBRICKS AND CLAY — for foundry
FIRE HANDLES — assorted sizes
GRAPHITE — for foundry
IRON — pig, for foundry
LACQUER — transparent and colored, for finishing
NUTS — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds
OIL
1. Boiled linseed 2. Lubricating
3. Quenching and hardening

PACKING
Round, sheet, square, or tubular
PAINT — black asphaltum
PINS
1. Cotter, 3/32 to 1/4-in. diam. from 1/2 to 2 in. long
2. Flask, for flask repairs
3. Taper, Nos. 0 to 6, 3/4 to 2 in. long

PUMICE POWDER
RIVETS
1. Copper, with burrs, Nos. 7 to 14, lengths, 1/4 to 3/4 in., selected sizes
2. Iron, No. 14 gauge to 5/16 in., flathead or button head, 1/4 to 1 in. long, selected sizes
3. Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes

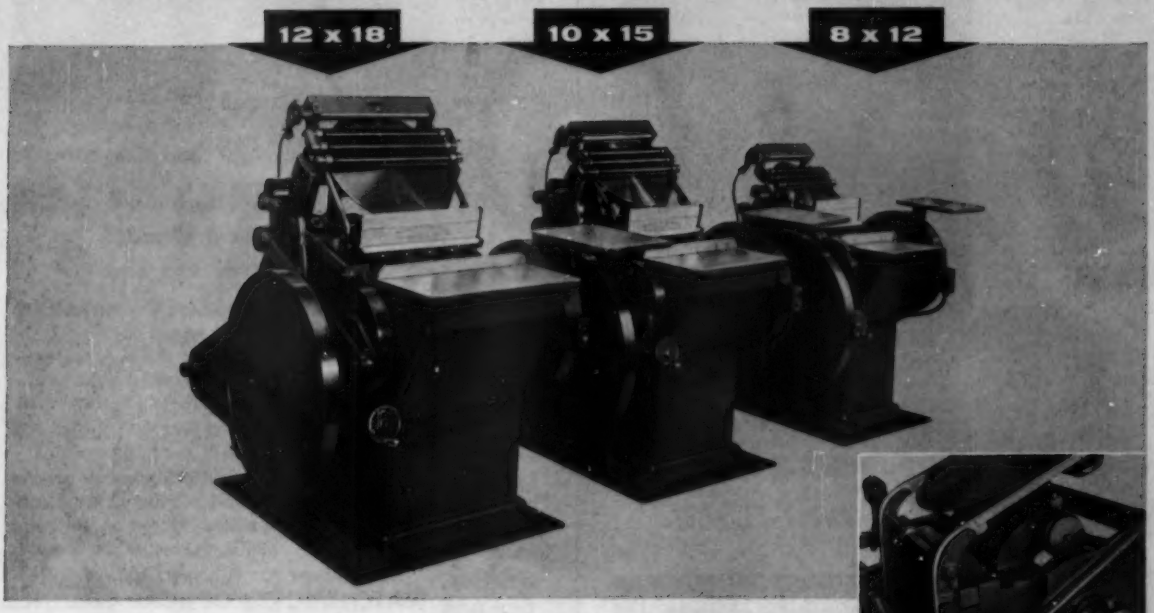
SAND
1. Molding in 350-lb. barrels or 800-lb. casks
2. Parting, in 350-lb. barrels or 800-lb. casks

SCREWS
1. F.H. or R.H. iron or brass, selected sizes and kinds
2. Cap and machine, iron or brass, selected sizes and kinds
3. Set, head and headless

SOLDER — acid or rosin core; bar, or solid wire
SOLDERING PASTE OR SALTS
STEEL
1. Bessemer, rod, 1/61 to 3/8 in. by 64ths, in 4-ft. lengths, selected sizes
2. Bars, cold rolled, 1/8 to 3/4 in. thick, 1/2 to 2 in. wide, 12-ft. lengths, selected sizes
3. Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes

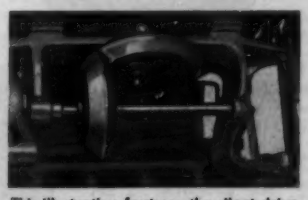
(Continued on page 53A)

Announcing Chandler & Price NEW MODEL-N PRESSES

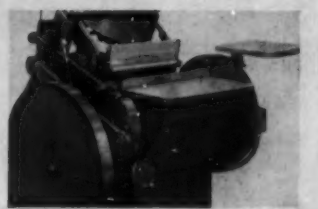


This illustration shows the adjustable bed tracks, the extension roller tracks and the impression counter with bracket.

This illustration shows the belt guard, the motor and expandable pulley.



This illustration features the silent drive for the ink disc.



All operating controls are placed on the front of the press within convenient reach of the operator.

Complete hand-fed units designed for schools and institutions

Chandler and Price New Series Presses for many, many years have been the choice of schools and other institutions where hand-fed presses are required.

Therefore, Chandler & Price takes pleasure in announcing a NEW line of hand-fed presses in their MODEL-N. The MODEL-N is a finer press, a more modern press, and a *complete* press (no extras to buy) and is built in 3 sizes—8 x 12 — 10 x 15 — 12 x 18.

A complete press

When you buy a MODEL-N Press, you have no extras to consider. Each press is a complete unit, from floor pan to impression counter, including such items as adjustable bed tracks and extension roller tracks. Many additional refinements like the plastic-coated feed and delivery boards, a hard-fiber flywheel guard permanently attached, new silent drive for ink disc, motor bracket well above the floor, constant speed motor with variable speed drive and an all-new modern grey finish make MODEL-N the finest hand-fed press C & P engineers have ever designed. This is a press that meets any requirement for both fine halftone as well as color printing. The choice of three sizes makes possible the selection of a size suitable for any printing production which can be hand-fed. Write for complete details.

THE CHANDLER & PRICE COMPANY
6000 CARNEGIE AVENUE • CLEVELAND 3, OHIO

(For more information from advertisers, use the postcard on page 91A)

PARKS PLANERS Give Your Students Practical Experience on Popular Industrial Machines

. . . the experience of working on the same type of high-speed planers they will eventually use in their trade.

20" THICKNESS PLANER

PARKS NO 20—A modernly designed, precision-built, high speed production surfacer that planes lumber up to 20" wide and 6" thick. Available with knife-grinder at additional cost.

12" THICKNESS PLANER

PARKS NO. 95 — A compact, sturdy thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive literature on both machines illustrated as well as on PARKS wood- and metal-cutting Band Saws, Radial Saws, Planer-Jointer Combination Machines.

The PARKS WOODWORKING MACHINE COMPANY
Manufacturers of Quality Woodworking Machines Since 1887

Lightweight and Comfortable

SAFETY SPECTACLES

90% Protection Most Workers will wear 100% of the time

"Tuc-Away", featherlight Safety Spectacles provide the protection and wearing comfort that pleases most wearers.

Optically Correct, shatterproof methacrylate lenses snap in and out of the frame . . . can be easily replaced by each worker.

Choice of interchangeable Lenses with side and bottom protection give greater flexibility and economy . . . Lens colors: Clear, Light, Medium and Dark Green and Gold.

3 Temple Styles for greater comfort . . . Metal or Plastic Temples with "retrax" adjusting action, or Plastic Club Temples.

WRITE FOR FULL INFORMATION

eye SAVERS WATCHEMOKET OPTICAL CO., INC.

232 West Exchange St., Providence, R. I.

In Canada: Levitt-Safety Limited, Toronto 10, Montreal 26, Winnipeg

Locker and Cabinet Base WOODWORKING BENCHES

No. 64-50-402C

3 TYPES OF BENCHES — TAKE YOUR CHOICE.

Size is 64" long, 50" deep and 33¾" high. The laminated edge grain maple top is 2¼" thick and has end bolsters.

1. No. 64-50-402C has two steel cabinets (back-to-back). Each cabinet is 36" wide, 21" deep and 31" high.

2. No. 64-50-412B has twelve box lockers (six back-to-back). Locker size is 12" wide, 21" deep and 15" high.

3. 64-50-407BC is a combination of above benches — having six box lockers and a cabinet base (arranged back-to-back).

All doors equipped with spring hinges and padlock attachments.

No. 64-50-412B

SEND FOR FREE SCHOOL EQUIPMENT CATALOG TODAY!

VISIT OUR EXHIBIT at the AMERICAN INDUSTRIAL ARTS ASSOCIATION CONVENTION LONG BEACH, CALIF. APRIL 23-25.

PARENT METAL PRODUCTS INC.

6801 State Road • Dept. V-26 • Philadelphia 35, Pa.

SAFE! PERMA-GRIT*

CUTTING WHEEL

An amazing new wheel for table or radial saws. Tungsten carbide grit permanently bonded on edge and sides replaces saw teeth. No kick-back, no-grab features provide truly safe operation. Students can saw, sand, shape, dadoe or plough without changing the blade when using this versatile accessory. Used with wood, veneers, compositions, fiber glass, plastics, it cuts *and sands* in one operation. Produces smooth finish even on thin veneers. Choose from 8" dia. with ⅜", ½" arbor hole or 10" dia. with 1", ¾", ⅝" arbor hole. Price: 8" dia.—from $9.95; 10" dia.—from $14.95.

- NO TEETH
- NO KICK-BACK
- SPEEDS LEARNING
- INCREASES WOODWORKING ABILITIES

*A Trade Mark of SKIL Corporation

Made only by SKIL Corporation, manufacturer of famous SKIL and SKILSAW products, 5033 Elston Ave., Chicago 30, Ill. In Canada: 3601 Dundas St. W., Toronto 9, Ontario

(For more information from advertisers, use the postcard on page 91A)

(Continued from page 50A)

4. Rods, hexagon and square, cold rolled, ¼ to ¾ in., in 12-ft. lengths, selected sizes
5. Round, cold rolled, diameters ⅛ to 1 in., lengths 12 ft., selected sizes
6. Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in.
7. Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in., selected sizes
8. Threaded rods, Nos. 6 to 10, in 12-in. lengths, Nos. 12, 14, ¼ in., and 5/16 in., in 24-in. lengths, selected sizes

TIN
1. Pigs, for casting alloys
2. 1C, 1X, 20 by 48 in.
3. 1XX, 20 by 48 in.

WASHERS AND BURRS
1. Copper burrs, Nos. 3 to 14, in 1-lb. boxes
2. Iron burrs, Nos. 3 to 14 in 1-lb. boxes
3. Brass washers, 3/16 to ½ in. by 16ths
4. Iron washers, 3/16 to ½ in. by 16ths

WELDING FLUXES

WELDING RODS (all rods come in 24-in. lengths)
1. Brazing, 1/16, ⅛, 3/16-in. diameter.
2. Cast aluminum 3/16, ¼, and 5/16-in. diameter
3. Cast brass, 3/16 and 5/16-in. diameter
4. Cast bronze, ¼-in. diameter.
5. Cast copper, 3/16 and ¼-in. diameter
6. Cast iron, 3/16, ¼, 5/16, and 5/16-in. diameter
7. Low carbon steel, ⅛, 3/16, and ¼-in. diameter

WHITE LEAD — for machine shop

WIRE
1. Annealed, 16 to 34 W and M gauge, selected sizes
2. Coppered market, 5 to 18 W and M gauge, selected sizes
3. Coppered spring, 2 to 18 W and M gauge, selected sizes
4. Galvanized, 5 to 18 W and M gauge, selected sizes
5. Piano, Nos. 2/0 to 36, selected sizes
6. Tinned, 16 to 24 W and M gauge, selected sizes
7. Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes

ZINC
1. Pigs, for casting alloys
2. Sheet, Nos. 4 to 14, sheets 36 by 84 in.

NEWS NOTES

(Continued from page 42A)

Future," by Dr. Francis C. Gamelin, assistant to the superintendent of the Robbinsdale, Minn., public schools, and a noted figure in guidance circles.

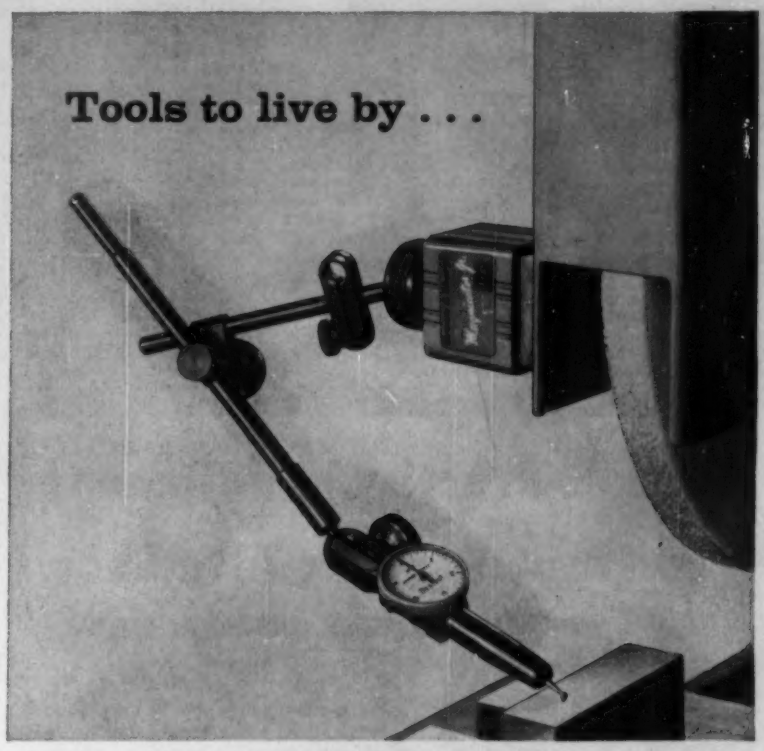
After the keynote speech, delegates had the opportunity of choosing from among 21 sectional meetings devoted to such diverse topics as "Children in Trouble," "Non-College Training Opportunities," and "Industry Challenges School Guidance Programs."

Concluding the conference was a general session at which Dr. Gamelin summarized conference accomplishments. A panel of guidance directors and administrators then asked questions of special interest of the chairmen who had presided over the sectional meetings.

INSTITUTE FOR SHOP TEACHERS

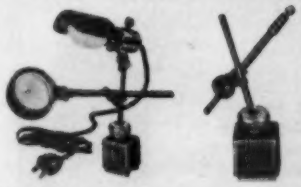
An Institute for General Shop Teachers was held at The University of Michigan, Ann Arbor, on Saturday, January 10. It was presented by the U-M Department of Vocational Education and Practical Arts and the Extension Service.

(Continued on page 56A)



Brown & Sharpe offers the young machinist accurate, easy-to-use, reliable tools that will help him take full advantage of his careful training . . . now and in the years ahead.

NEW B&S MAGNICATOR JR.
Holds small tools firmly almost anywhere . . . without clamping



A powerful permanent magnet in Magnicator Jr.'s base anchors it quickly to any ferrous metal, flat or round. Used with BesTesT Dial Indicators, lights, magnifiers and other accessories. Makes inspection and setup work much easier, especially in cramped quarters. Also available in larger "Magnicator", with releasing lever.

B&S BesTesT DIAL INDICATOR
Versatile and compact . . . ideal for use with Magnicator Jr.

The BesTesT Dial Indicator fits almost any holding tool, and is particularly useful with Magnicator Jr. (photo above). Being only 2.6" long, it works in tight spots. Lever reverses position of contact point . . . swivel clamp attaches in several positions. Range: .030" by .0005". Furnished in wooden case with rod, bars, 3 different contact points.

Ask your local Brown & Sharpe distributor to show you these fine tools, or write for information. Brown & Sharpe Mfg Co., Providence 1, R. I.

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe B&S

PRECISION TOOLS AND GAGES — MILLING, GRINDING AND SCREW MACHINES
CUTTERS — MACHINE TOOL ACCESSORIES — PUMPS AND HYDRAULIC PRODUCTS

(For more information from advertisers, use the postcard on page 91A)

New Publications

The Atom and the Energy Revolution

By Norman Lansdell. Cloth, 200 pp., 6¼ by 9½ in., illus., $6. Philosophical Library, Inc., New York, N. Y.

This book contains much interesting and useful information about world energy resources and demand, new sources of energy, the atom and its energy, methods of releasing atomic energy, sources of natural materials for atomic energy development, the exploitation of atomic energy, political and commercial organizations for atomic energy development, radiation risks and insurance against them, and the world impact of atomic energy.

The Craftsman's Manual — Vol. 1 and 2

Compiled by F. J. Christopher and Rosemary Brinley Christopher. Each volume, cloth, 192 pp., 7⅞ by 10 in., illus., price, $20. Philosophical Library, New York, N. Y.

A useful two-volume manual which will save the handy house owner a great deal of money in maintaining his home. The book outlines what tools are required, how to make a bench for the workshop, sawing horses when they are needed, and also how to care for and sharpen tools.

It also explains how to take care of troubles that may arise with the water, gas, and electrical systems. Interior and exterior home repairs are well illustrated, and the directions given for making them are clearly shown and understandably described.

The Practical Dictionary of Electricity and Electronics

By R. L. Oldfield. Cloth, 216 pp., 5¾ by 8½ in., illus. American Technical Society, Chicago, Ill.

The dictionary defines electrical and electronic terms so that the beginner can get a clear picture of what a given term in these fields means.

It also contains many illustrations to clarify the definitions given. The author has shown how the reader may use the dictionary. The book also contains a handbook which presents formulas and tables much used by those who work in the fields of electricity and economics.

Mechanics, Part I — Statics

By J. L. Meriam. Cloth, 393 pp., 6 by 9¼ in., illus., $5. John Wiley & Sons, Inc., New York, N. Y.

This is the second edition of this book. It emphasizes engineering, i.e., applied mechanics.

The seven chapters of the book explain in words and symbolic figures the principles of statics, force systems, equilibrium, structures, distributed forces, friction, and work and energy.

The appendixes present review problems, vector methods, the moment of inertia, and movement of inertia of mass. The appendix also contains a number of useful tables.

Concise International Dictionary of Mechanics and Geology

By S. A. Cooper. Cloth, 400 pp., 4⅝ by 7 5/16 in., $6. Philosophical Library, New York, N. Y.

This handy dictionary is designed especially for mechanics, engineers, and manufacturers who want to find the equivalents of expressions in English, French, German, and Spanish.

The terms presented are mostly machine parts and mechanical expressions. Metals, alloys, geological, and chemical and mathematical words also have been included.

Mathematics for the Layman

By T. H. Ward Hill. Cloth, 343 pp., 4¾ by 7½ in., illus., $4.75. Philosophical Library, New York, N. Y.

This interesting book gives a general history of mathematics from the beginning. It tells who the men were who helped to improve it until it grew into the helpful aid we now know it to be. Also how the symbols and numbers were gradually invented, how fractions, decimals, percentages are used.

Geometry, algebra, graphs, logarithms, and calculus are also explained, and how mechanical aids for calculation are used.

Stereophonic Sound

By Norman H. Crowhurst. Paper, 118 pp., 5½ by 8½ in., illus., $2.25. John F. Rider Publisher, Inc., New York, N. Y.

Stereophonic Sound is the first true assessment of this exciting new medium. It provides all the information needed to add this new dimension to hi-fi listening pleasure. In an easy, interesting style the author explains the theory of stereophonic sound; the difference it can make in listening pleasure; what goes into making it successful; various systems available or likely to become available.

The author is an authority on the subject, and covers such systems as binaural, two and three channel stereophonic, stereosonic, coded-stereophonic, and the use of these systems with radio, disk, tape, and other "media." This information is applied to selection and placement of the speakers for the best home stereo reproduction.

Here's Practical Equipment For Your Graphic Arts Shop

CHALLENGE offers you equipment that has proven to be practical in hundreds of school shops throughout the country. Sturdy, practical, yet reasonably priced. . . Challenge gives you the best instruction tool value for your equipment dollar.

FOR PAPER CUTTING

Challenge offers you the widest range of both hand lever and power cutters in the sizes and types most widely used by school shops. Also available are special safety controls designed specially for school needs.

FOR PRESSWORK AND PROOFING

Thirteen different models of proof presses are also available. These can also be used for cylinder presswork instruction, for short run jobs, as well as making offset and duplicator plates direct from type forms.

FOR COMPOSING ROOM AND BINDERY WORK

In addition, Challenge offers a wide range of paper drilling machines for drilling and cornering of loose leaf sheets; also Quoins, Keys, Iron Furniture, Galleys and Galley Cabinets for your composing room and job make-up activities.

Challenge®

The Challenge Machinery Co.
Grand Haven, Michigan

The Challenge Machinery Co. IA-3
Grand Haven, Mich.

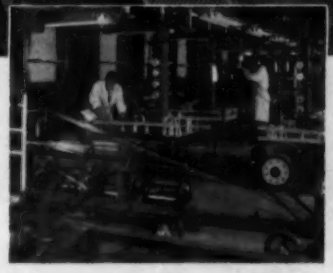
Please send your helpful information on—

☐ Challenge Paper Cutters ☐ Challenge Paper Drills
☐ Challenge Proof Presses ☐ Challenge Quoins, Keys, Iron Furniture, Galleys, Galley Cabinets

Name_____ Title_____
School_____
Address_____
City_____ State_____

(For more information from advertisers, use the postcard on page 91A)

Teach how Pittsburgh Color Dynamics® provides better, safer working conditions in industrial plants



Many educators recognize that better knowledge of the use of color is making an important contribution to the improvement of production techniques and morale as well as the safety of workers in industry.

• **That's why** Pittsburgh's system of COLOR DYNAMICS is being included in many vocational training courses.

• **With this modern system,** machines are painted in colors that permit the operator to see his work better. Moving parts are readily distinguished from stationary parts and production materials. Eye travel is reduced, and fatigue and nervous tension are lessened.

• **Use of morale-building colors** on walls and ceilings creates a more cheerful and brighter environment. This makes for a better relationship between management and workers.

• **Safety colors** on controls, traffic lanes, cranes and mobile equipment call attention to hazard areas and reduce danger of time-loss accidents.

• **All these benefits** from the use of COLOR DYNAMICS are vital ones and, certainly, should be taught to the shopman of tomorrow. Why not begin teaching *your* students this functional use of the energy in color? Better still, you can easily and inexpensively provide practical demonstrations of its effectiveness by applying it in the decoration of classrooms and equipment.

Get this Color Plan for Your Classrooms—It's FREE!

• Write today for a free booklet which explains the principles of COLOR DYNAMICS and how they can be applied effectively in industry. Better still, we'll be glad to demonstrate its benefits in your classrooms by providing you with detailed color plans for your study areas and equipment, without cost or obligation. Call your nearest Pittsburgh Plate Glass Company branch. Or mail coupon at right.

Send for a Copy of this FREE Book

PITTSBURGH® PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

Pittsburgh Plate Glass Co., Paint Div.,
Department IA-30, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "COLOR DYNAMICS."

☐ Please have your representative call for a COLOR DYNAMICS survey without obligation on our part.

Name_____

Street_____

City_____ County_____ State_____

The complete WOOD FINISH in one can

Nothing else to use from raw wood to bar-top finish

Quick drying Deft is made to order for industrial arts classes.

- SEALS, PRIMES, FINISHES
- Ready to use, requires no thinning
- Will not darken with age
- Will not skin in can — Good to the last brushful
- Will not bloom, blush or bubble

The clear, semi-gloss quality finish that saves time on every job.

Write for FREE Classroom FINISHING INSTRUCTIONS Wall Placard, 11" x 14". Dept. I.V.

DESMOND BROS., 1826 W. 54th St., Los Angeles 62, Calif.
Gentlemen: I would like Finishing Instructions Placard.
Name.....
School.....
Address.....
City.....Zone.....State.....

AUTOMOTIVE EQUIPMENT

(Continued from page 45A)

2. N.C. Standard — hand tap plug type, national course standard thread, high quality carbon heat treated steel, 1-set: ¼"–20, 5/16"–18, ⅜"–16, 7/16"–14, ½"–13, 9/16"–12
3. National fine standard, hand tap, plug type high quality carbon heat treated steel, 1-set: ¼"–28, 5/16"–24, ⅜"–24, 7/16"–20, ½"–20, 9/16"–18, ⅝"–18, ¾"–16
4. National Standard Pipe, ⅛", ¼", ⅜"

TAP WRENCH

1. T-handle, single handle, adjustable chuck, hardened jaws, made of quality steel
2. Machine screw tap wrench, T-handle adjustable vise jaw, for holding machine screw tap size 6–32 to 12–28, quality steel
3. National Standard tap wrench, adjustable vise jaw, for holding tap sizes ¼" to ¾", high quality steel

WRENCH, ADJUSTABLE

6" — single and adjustable jaw, forged steel, replaceable parts

WRENCH, MONKEY

10" length, 2" capacity, forged jaws and handle with nonmetallic fitted handle

WRENCH, PIPE

10" — length, ⅛" to 1" pipe capacity, forged and hardened tool steel

WRENCH, SPANNER

Adjustable hook drop forged carbon steel hardened and finished smooth. Set of 3, capacity ¾" to 4¾" diameter

It is recommended that only high quality alloy steel wrenches and sockets be purchased. Specifically, they should have lifetime guarantees so that cracked sockets and sprung wrenches can be replaced free of charge

WRENCHES, BOX

Double broached hex, double offset drop forged chrome-moly alloy steel. Lifetime guarantee and replaceable. 4 to 8 sets: 4½" to 6" (short length), 5/16" and ¼", ¼" and 5/16", 5/16" and ⅜", ⅜" and 7/16", 8" to 19" (long length), ¼" and 5/16", 5/16" and ⅜", 7/16" and ½", 9/16" and ⅝", ⅝" and 11/16", ¾" and ⅞", 13/16" and 1"

(Continued on page 61A)

NEWS NOTES

(Continued from page 53A)

The 9:30 a.m., opening general session was held in the Third Floor Conference Room, Union, with C. Robert Hutchcroft, associate professor of industrial arts education, as chairman.

A panel discussion took place on "Industrial Arts Today — How Do Results Compare With Claims?" The panel consisted of William H. Mills, assistant to the director of University School; Ira C. Madden, McCrary School, Detroit; Howard Nunn, superintendent, Harper Creek Community Schools, Battle Creek; and Robert H. Lindner, Ypsilanti High School.

There were demonstrations and exhibits in the University High School Industrial Arts Laboratory in the afternoon. They included industrial arts in action — college students; exhibit of crafts — junior high pupils; portable power tools, exhibits of teaching aids, publications of interest to industrial arts

(Continued on page 64A)

BUILD PINT-SIZE FIBERGLAS RACER BODIES TO AROUSE KING-SIZE STUDENT INTEREST

Quarter-Midgets for Kids!

Newest Sensation in Auto Racing Offers Your Plastic Craft Students the Thrill and Challenge of Designing Sleek, Scaled-Down Versions of Big Time Sprint Car Bodies — Gives Them Practical Experience in Latest Fiberglas Techniques!

Send for FREE literature giving complete buying data on everything you need for school shop lay-ups of Fiberglas-Polyester and Epoxy Resins. It describes in detail Glass Cloth, Resins, Extenders, Catalysts, Solvents, "How-To" Books, etc. Provides basic information and procedures preparatory to undertaking track car bodies and other projects in this versatile medium, such as, boats and furniture.

SPECIAL OFFER! Fiberglas-Polyester "COVER-IT" KIT

Contains the right amount of material for the beginner student, or to experiment with yourself. Lets you see how easy it is to repair boats, toys, lamps, furniture, etc. Complete Kit.....$3.95 (plus 50c postage).

Make Your Own Plastic Tool Handles with TENITE II SCREW DRIVER HANDLE STOCK

Makes tough, durable handles for screw drivers, trowels, plastic gavels, chisels, mallet heads and hand drills. The finest material made for any application that must withstand shock and abuse. Available in two styles: Fluted round type, ½" thru 1¼" dia.; smooth round, 1", 1¼" and 1½" dia. Amber transparent color, only.

HOW TO MAKE BOWLS OUT OF FIBERGLAS CLOTH — POLYESTER RESIN

It's easy, fascinating work. Calls for inexpensive equipment. Students can make bowls of different shapes and sizes using remnants of drapery material, dress goods, even burlap, for decorative effects. Free literature gives instructions and prices.

ROPE THAT FLOATS!

Made of Polyethylene and produced by the twisted-spun-laid method. It's attractive, long lasting, lightweight, dimensionally stable. Completely waterproof and bouyant. 30% lighter than natural fibre rope. Has extremely high resistance to virtually all types of acids and solvents, salt water, alcohol. It is unaffected by mold, bacteria, rot, fungi. Has excellent weathering characteristics. Does not deteriorate with age. Available in blue, yellow and white, 1/8" to ¾" dia. Ideal for water ski tow lines, lane markers, for swimming pools, heaving lines and other life-saving equipment, functional and decorative applications.

INSPIRE ARTISTIC TALENTS OF YOUR STUDENTS!

Using ACRYLOID B-72 (a clear, syrup-like liquid that hardens to a waterproof film), you can attach thin, colorful objects on SYNSKYN (a translucent, fire-resistant Polyplastex material) to make a wide variety of unusual and breath-takingly beautiful panellings. ACRYLOID B-72 is employed both as an adhesive to hold the decorative pieces on the SYNSKYN base, and as a finish coating over the complete job. Leaves, flowers, small shells, ferns, butterflies, feathers, fishing lures, photos make perfect decorations, and the panels are ideal for folding screens, room dividers, lamp shades, sliding doors, etc.

Build Your Own Plastic Greenhouse with POLYETHYLENE & VINYL FILM

We have them 0.002" and thicker. Vinyl in rolls up to 6 ft. wide; Polyethylene up to 40 ft. wide. Also make a perfect moisture barrier and mulch on strawberry plant and flower beds.

Send for FREE Price List!

It gives helpful buying data on Plexiglas, Acetate, Castolite, Cold Setting and Hot Melt Casting Resins, Plastic Foam, Vinyls, Finishing Compounds, and others. Write today!

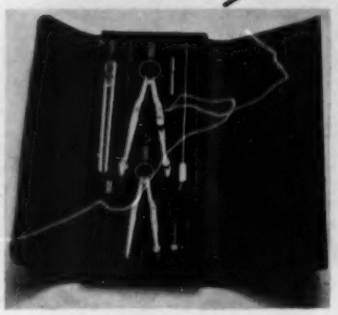
PLASTIC PARTS & SALES
1157 S. Kingshighway Blvd., St. Louis 10, Mo.

(For more information from advertisers, use the postcard on page 91A)

NEW REVOLUTIONARY COMBINATION DESK AND DRAFTING TABLE

Ideal For Schools

- Desk Has Hard Plastic Rollback Top
- Drawing Board Built Into Table
- Europe's Finest Beechwood
- Old World Craftsmanship
- Priced — Startlingly Low



M08A

DRAWING SET

- Professional Quality
- Priced Right For School Use
- Individual Instruments Available
- This Is One Example From Our Vast Instrument Selection

Our drawing instruments are widely accepted in the American Educational Field due to extremely good quality, low prices and our 100% guarantee.

For Free Information on Our Products, Write:

116 Broad St. New York 4, N. Y.

New processes, *new surfaces . . .*

...New Inks!

You have been using Higgins American Waterproof India Ink (4415) on absorbent tracing cloth. Now the water repellent surfaces of new cloths and foils require inks which work with all of your instruments on these new surfaces.

HIGGINS *supplies this need with . . .*

4425
Non-Waterproof Black
Removable from plastic film by water.

4435
Waterproof Acetate Black
Waterproof on plastic film and water-repellent drafting surfaces.

The basic art medium since 1880

HIGGINS INK CO., INC. *Brooklyn, N.Y.*

APPROVED AND USED BY SCHOOLS EVERYWHERE

for Record Reproduction *and Blueprint Instruction*

P&H *SpeedMaster* **WHITEPRINTERS**

In Sizes and Speeds for Every Need and Budget

Schools everywhere find SPEEDMASTER ideal for economical record reproduction, drafting class, shop use and a variety of photo-exact duplicating. The time-saving, work-saving efficiency of these machines has made them the choice of industry, too. With SPEEDMASTER anyone can easily make exact, same-size black-line and colored-line whiteprints of any translucent original. Printing and developing are synchronized. Electronic drive provides instant speed changes with full stop and reverse control.

NEW LOW PRICES! Model 1400CT. Table Model $1295
Model 1400C. Floor Model $1455

Send for free Bulletin No. 58S2

P&H SALES CORP

REPRESENTING **PECK & HARVEY** MFG. CORP.
5649 N. WESTERN AVE., CHICAGO 45
Progressing with the Reproduction Industry Since 1937
MFRS. OF WHITEPRINT, BLUEPRINT & PHOTOCOPY EQUIPMENT

(For more information from advertisers, use the postcard on page 91A)

picked by professionals

Reach for a Venus drawing pencil and get the sharper, clearer line (in all 17 degrees of hardness) your work demands. Venus homogenized lead holds a needle point longer, insures uniform smoothness, perfect smudge-free work. Pressure proofing seals the lead to the wood along its full length so the Venus is stronger. Prove Venus superiority for yourself. *Send for the educational brochure "Atomic Energy and You" and get a FREE Venus Drawing Pencil.*

VENUS drawing pencils

VENUS PEN & PENCIL CORPORATION, HOBOKEN, N. J.

Drafting — Small Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

ADJUSTABLE-CURVE RULER
BEAM COMPASS
BENCH BRUSHES
BLUEPRINT
1. Frame or machine
2. Washing trays or washer
3. Paper tube, airtight
4. Drying rack or dryer
BOOKCASE
CABINET
1. For filing drawings
2. For storing drawing boards
3. For storing drawing instruments
4. For storing models
CALIPERS — 6 and 8 in., inside and outside
CHAIR — teacher's
CHALKBOARD
1. Permanent or portable
2. Compass, 15 in., with locking device
3. Drawing set, T-square, straightedge, triangle, and protractor
DESK — teacher's
DIVIDERS — proportional
DRAFTING MACHINE — and accessories
DRAFTSMAN'S STEEL PROTRACTOR
DRAWING BOARDS — large
DRAWING-BOARD SUPPORTS — to be set on or attached to woodworker's bench
DRAWING TABLES AND STOOLS
1. For students
2. For teachers
INK-BOTTLE HOLDER
IRREGULAR CURVES — Nos. 17, 21, and 24, wood, or transparent
LETTERING ANGLES
LETTERING PENS — assortment of 12
LEVEL OR TRANSIT — builders' for architectural students
LEVELING ROD — for use with the transit
MACHINISTS' COMBINATION SET — 12 in.
MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETER
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
TABLE
1. For cutting and trimming drawings and blueprints
2. For disassembling and re-assembling machine parts and models
TAPELINE
1. 100 ft., steel, for architectural students
2. 50 ft., steel or metallic
TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
1. 30-60 deg., 14 in. transparent
2. 45 deg., 10 in. transparent
TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing board
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK

To be provided by, or for, each student

Drafting Supplies

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architect's, triangular
SCALE GUARD
SLIDE RULE — as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30-60 deg., 10 in. transparent, and 45 deg., 8 in. transparent

Drafting Equipment

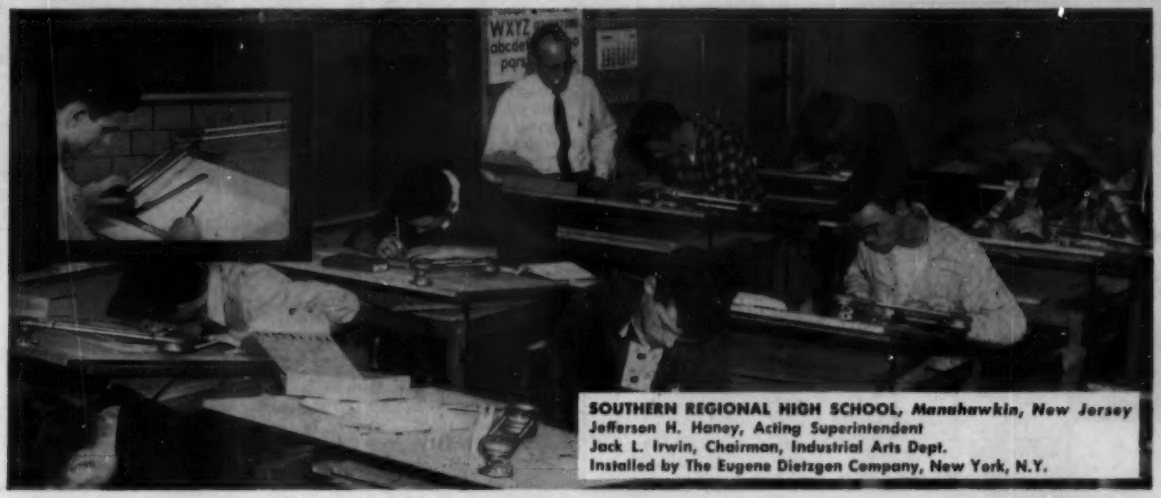
BICHROMATE OF POTASH — crystals
BLUEPRINT
1. Paper, 36 in. wide
2. Writing fluid
PAPER
1. Cross section, 8½ by 11 in.
2. Detail, 24 by 36 in.
3. Drawing, 24 by 36 in.
4. Isometric, 7 by 10 in.
5. Tracing, 36 in.
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
1. Fixing salts
2. Paper, 36 in.
3. Writing fluid

Drafting — Additional Supplies

To be provided by, or for, each student.

ERASERS
1. Cleaning
2. Ink
3. Pencil
INK
1. Black, waterproof
2. Colored, if required
PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H
PENCIL POINTER PAD
THUMBTACKS OR SCOTCH TAPE

(For more information from advertisers, use the postcard on page 91A)



SOUTHERN REGIONAL HIGH SCHOOL, *Manahawkin, New Jersey*
Jefferson H. Haney, Acting Superintendent
Jack L. Irwin, Chairman, Industrial Arts Dept.
Installed by The Eugene Dietzgen Company, New York, N.Y.

With Universal Desk-Topper drafting machines you know your drafting students are developing proper training habits for industry

★ Widely used in schools and colleges across the nation . . . specially budget priced for schoolroom use.

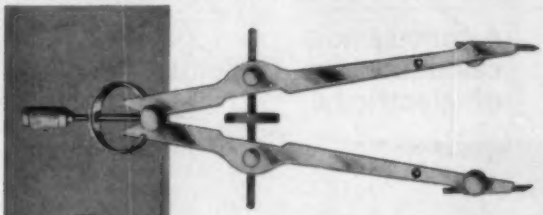
UNIVERSAL DRAFTING MACHINE CORP.
7960 LORAIN AVENUE • CLEVELAND 2, OHIO

FREE text manual

Chapters 3 and 4 constitute a suggested course of instruction in drafting machine technique and operation. Write for your free copy. Please include school name and address.

Makers of UNIVERSAL BOARDMASTER & UNIVERSAL TRACMASTER . . . the Drafting Machines Preferred by Industry

VEMCO



Stainless

STEEL COMPASSES

at a new low price

The famous VEMCO stainless steel Blue Dot compasses are now available at a lower price, but with the same fine quality and precision performance. And remember, American made VEMCO compasses are produced by modern manufacturing processes, which permit the use of durable steels not found in hand-made instruments.

SPECIAL SCHOOL CATALOG ON REQUEST

V. & E. Manufacturing Co.
Department R-4
P. O. Box 950-M
Pasadena, Calif.

VEMCO

MAYLINE

GEM PEDESTAL TABLE

A Table to Fit Your Budget.

C7702 ART TABLE

Five styles of tables from which to choose — in five price brackets. Let us help you furnish your classroom.

C7703B DRAFTING TABLE

Symbol of MAYLINE Superiority

MAYLINE COMPANY
623 No. Commerce St.
Sheboygan, Wisconsin

MAYLINE

(For more information from advertisers, use the postcard on page 91A)

LOOK TO GARRETT-CARGO

FOR THE FINEST QUALITY DRAWING TABLES AND SEATING DESIGNED FOR VOCATIONAL EDUCATION DEPARTMENTS!

OTHER MODELS AVAILABLE
LARGE 24 x 36" ADJUSTABLE DRAWING BOARD
BUILT ON TABORET!
WELDED TUBULAR STEEL CONSTRUCTION
AC-440
OVER 25 MODELS OF CHAIRS AND STOOLS AVAILABLE EQUIPPED WITH THE EXCLUSIVE AUTOMATIC "LIFT-A-DOT"
Full 8" height adj.
C-1624
ALL NEW U-I PORTABLE DRAWING BOARD, COMPLETELY FOLDS AND ADJUSTS TO ANY POSITION FROM VERTICLE TO HORIZONTAL. AN ECONOMY BOARD OF HIGH QUALITY.

WRITE FOR INFORMATION AND PRICE LIST.

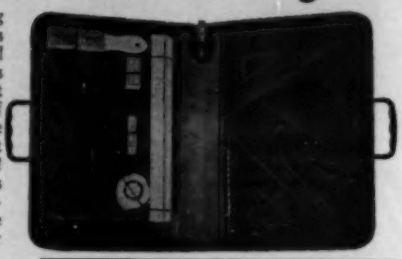
GARRETT TUBULAR PRODUCTS, INC.

P.O. BOX 237 GARRETT, INDIANA

Used and Praised in Hundreds of Schools!

BERGER "all-in-one" Drafting Kits

All needed drafting tools combined in this one easy-to-carry case! Students come to class fully equipped, don't have to beg the loan of a protractor, a triangle or scale. Sessions get under way promptly! Instructors in hundreds of schools say it's today's indispensable teaching aid. Tell your students about it.



Berger Drawing Set #510 plus complete kit: $10.50
Prices quoted are for 6 or more kits. Instructors may buy sample kit at same low price.

YOUR CHOICE OF 8 DIFFERENT DRAWING SETS — PLUS

Protractor	French Curve
Engineer's Scale	Draftsman's Tape
Architect's Scale	Pencil Pointer
8" Triangle (45°-90°)	2 Drawing Pencils
10" Triangle (30°-60°)	2 Erasers

All in attractive, durable, 12" x 16" 3-way zipper carrying case of scuffproof, waterproof Texon with slide-in handles. Inner compartments for papers. Opens to 16" x 24".

Prices for Complete Kits: $7.86 to $18.90

New Economy Size Porta-Draft Kits from $5.58

Choice of Drawing Sets . . . *plus*

Protractor	French Curve
12" Triangular Scale	Pencil Pointer
6" Triangle (45°-90°)	Drawing Pencil
8" Triangle (30°-60°)	2 Erasers

In handy 10" x 14" zipper carrying case of Texon. Two inner compartments for note papers. Opens to 14" x 20".

Write for literature and complete prices.

BERGER SCIENTIFIC SUPPLIES, INC.
39 Williams St., Boston 19, Mass.
Materials and Equipment for Engineers, Architects, Surveyors and Draftsmen

SINCE 1868

DIXON TOOLS

~fine tools for~ Student Workers in Art Metal Craft

In the metal working arts money is saved by equipping with high-grade Dixon tools — always dependable — the Standard of Quality among metal craftsmen

Headquarters for . . . . . .

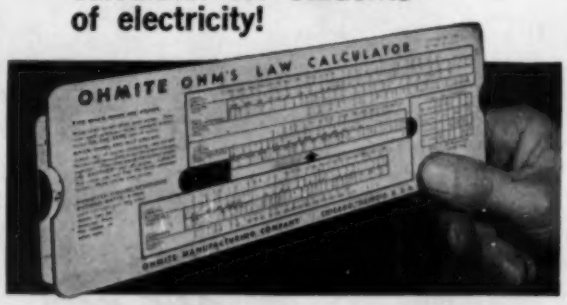
ART METAL CRAFT TOOLS and Supplies
ENAMELING ON COPPER Supplies
ENGRAVERS TOOLS and Supplies
HANDICRAFT TOOLS and Supplies
JEWELERS TOOLS, Equipment and Supplies
LEATHER WORKING TOOLS and Supplies
METAL CRAFT TOOLS and Supplies
SHEET METAL EQUIPMENT and Supplies
SILVERSMITHS TOOLS and Supplies
METAL SPINNING TOOLS and Equipment
WOOD WORKING TOOLS and Supplies
JEWELERS WORK BENCHES, Tools, etc.
TEXT BOOKS covering Jewelry, Metal Arts and other Crafts

. . . . . .

THE NEW DIXON CATALOG of TOOLS and SUPPLIES for ART METALCRAFT, JEWELRY MAKING and ENAMELING will soon be off the press. Write today for your copy; state name of school and subjects taught.

WILLIAM DIXON, INCORPORATED
32–42 E. Kinney Street Newark 1, New Jersey

A time-saving calculator for students of electricity!



OHM'S LAW Calculator and Slide Rule

A time-saving calculator for your students after they have learned Ohm's Law. Solves Ohm's Law and many parallel resistance problems simply, quickly, accurately—with only one setting. Slide rule scales multiply, divide, find squares, square roots, etc. Only 9" x 3", heavily varnished cardboard, it fits conveniently into the pocket. Also available in durable vinylite at $1.50.

ONLY **25¢**

TEACHERS! only 15¢ each in quantities of 25 or more

OHMITE MANUFACTURING CO. 3656 Howard Street Skokie, Illinois

(For more information from advertisers, use the postcard on page 91A)

AUTOMOTIVE EQUIPMENT

(Continued from page 56A)

WRENCHES, ELECTRICAL
Open end, double end, thin chrome-moly forged steel, chrome plated electrical set of 9: 13/64" to 9/16" openings

WRENCHES, SOCKET
1/2" square drive and/or 3/8" square drive, thin wall, double broached, chrome alloy heat treated sockets. Chrome plated finish, 4 to 8 sets: 7/16", 1/2", 9/16", 9/16" extra thin for Ford V-8 85 h.p. connecting rods, 19/32", 5/8", 21/32", 11/16", 3/4", 25/32", 13/16", 7/8", 15/16"

WRENCH, HANDLE
11" — 1/2" and/or 3/8" square drive sliding "T" handle, alloy steel, lock-in plug connector

WRENCH, EXTENSION DRIVE
1. 5" — 1/2" and/or 3/8" square drive extension, alloy steel, lock-in plug connector
2. 10" — 1/2" and/or 3/8" square drive extension, alloy steel, lock-in plug connector

WRENCH, RATCHET (Reversible)
Ratchet gear, 1/2" and/or 3/8" square drive, quick reversible. Lock-in plug connector

WRENCH, DRIVE ADAPTER
1. 3/8" square female and 1/2" square male
2. 3/8" square male and 1/2" square female

WRENCH, TAPPET ADJUSTING
1. 1/2" — 9/16" open end, thin alloy steel wrench
2. 5/8" — 11/16" open end, thin, alloy steel wrench

WRENCH, UNIVERSAL JOINT
1. 3/8" and/or 1/2" sq. drive

Special Equipment and Testing Devices

Most of the special equipment used in the auto shop will last for a long time. Such things as compressors, grinders, welding torches, and creepers will stand up for many years with a minimum of periodic service.

Testing devices are more delicate and, consequently, more expendable. They must be repaired or replaced regularly. . . . It is of vital importance that meters, analyzers and testers be of the type used currently in the industry. The advice of local service people will be of great assistance when considering what types to procure.

AIR COMPRESSOR
1. 5 h.p., 26 cu. ft. min. capacity, max. pressure 150 PSI, complete with steel tank, regulator, pressure unloader, safety valve and piping
2. Air blow gun — forged brass, button valve type, 25 CFM at 100 PSI, specify hose size
3. Air line chuck — ball foot type with serrated shank. Specify hose I.D.

ALIGNING JIGS — for connecting rods

ARBOR PRESS — 25 ton hydraulic

BATTERY EQUIPMENT
1. Batteries, storage — automobile 6 volt, 100 amp. hour capacity; 12V, 50 amp. hr.
2. Battery carrier
3. Battery charger, tube rectifier type, 6 amp. capacity for 12 6-volt or 6 12-volt batteries
4. Battery charger, fast charger selenium rectifier type with charging rate controlled by battery temperature
5. Battery hydrometer with built-in thermometer
6. Battery syringe to water cells
7. Battery voltmeter, high rate discharge 0-3V, high capacity resistance unit, prong type

BENCH
1. Electric test — facilities for testing: generators, regulators and starting motors, 3 h.p. min. motor, variable speed drive for approximately 500-6000 r.p.m. tachometer, voltmeter, ammeter, shunts and resistors
2. Work, with vises (4" vise)
3. Work, portable with vise

BRAKE EQUIPMENT
1. Lining grinder with necessary adapters to grind and centralize car brake shoes
2. Drum lathe with necessary attachments for both turning and grinding, including brake cylinder hones, lining clamps, and brake drum micrometer
3. Reliner — combination riveter and grinder
4. Lining bonder and remover (check electrical supply)
5. Brake bleeder

CONTAINERS
1. Can, safety gasoline — 1 gal. 24 ga. lead coated, non-spill sealed. Trigger type pouring lip
2. Can, waste — galvanized 12" x 15" can with legs and spring lift cover

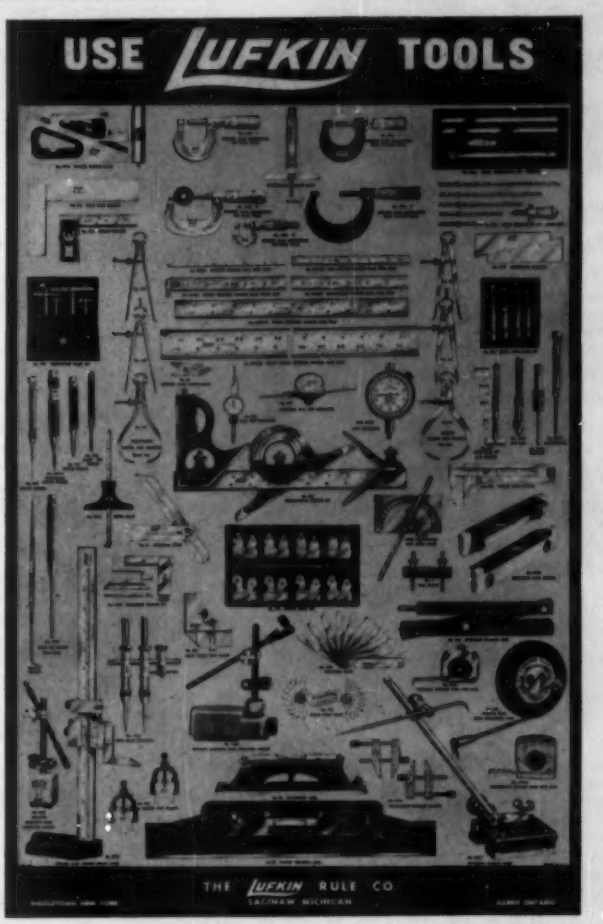
CHAIN HOIST — with overhead trolley and monorail, 3 ton capacity

CLEANER
1. Steam — low pressure type (check local code)
2. Ring groove cleaner

CORD EXTENSION LIGHT
Complete with molded rubber handle and socket. 20 feet super-service cable, molded rubber attachment plug and lamp guard

COMPASS — magnetic type needle

(Continued on next page)



Send me the colorful, new 30" x 46" LUFKIN tool chart

Name_____

School_____

Address_____

City_____ Zone_____ State_____

Mail Coupon to: LUFKIN RULE COMPANY • Saginaw, Michigan

(For more information from advertisers, use the postcard on page 91A)

AUTOMOTIVE EQUIPMENT

(Continued from previous page)

CREEPERS — 4 universal casters attached for easy movement

DEGREASER — with drum, filter and pump type circulated cleaning fluid

DRILL
1. Electric portable, ¼"
2. Electric portable, ½"
3. Press, 21", with motor and chuck

DYNAMOMETER
1. Chassis hydraulic absorption type
2. Engine hydraulic absorption type

ENGINE LIFTING EQUIPMENT — specify engine lift is to fit

ENGINE SUPPORT BARS — specify engine bars are to fit

FENDER COVERS

FURNACES — gas soldering

GAUGES
1. Cylinder gauge — dial indicator, universal type attachments complete in storage container
2. Compression meter, dial face for use in spark-plug chamber

GREASE DISPENSERS (chassis pressure type)

GRINDER
1. Cylinder, with motor and hone
2. Electric bench grinder, 2 six-inch dia. wheels, complete with motor, switch, guards and tool rests

GROWLER — 110 V-60 cycle, for testing generator and starter armatures

HONING MACHINE
Electric motor driven, for piston pins, king pins, etc., capacity to hone holes from ⅛" to 2⅝" inside diameter

HOT PLATE — electric — 110 V-60 cycle

JACKS
1. Floor roller, hydraulic type, 2 ton
2. Hand stationary hydraulic type, 1½ ton

LATHE — Metal bench type, 9" swing, back geared, motor driven

LIFTS
1. Automobile, hydraulic, twin post
2. Automatic transmission, hydraulic lift

MAGNET — permanent bar type ¼" x 1" x 6"

METERS
1. AVR 75 ampere D.C. 6, 12, and 24 volt scales d.c. complete with standard load resistor. Encased in durable portable case with heavy leads and clips attached
2. Meter, ammeter — 30 amp. capacity, encased in shock proof case
3. Meter, voltmeter — 10 volt rating

RADIATOR HYDROMETER — calibrated for alcohol, glycerine and ethylene glycol with built-in thermometer

SPRING TENSION SCALES
1. Brush and point spring tension scale 0–48 oz. spring type draw scale with hooked prong
2. Steering gear checking scale 0–4 lbs. spring type draw scale with steering wheel grip

STANDS
1. Car stand (horse) — 2 ton min. cap.
2. Engine build up stand, supported to swing through 360°, mounted on casters with locking device
3. Rear axle overhaul stand

TESTERS
1. Coil tester to measure continuity, capacity, and resistance. Tester complete with coil heater and circuit interrupter — for hot and cold tests
2. Condenser tester to measure continuity, resistance, and capacity of condensers
3. Distributor tester, portable type complete for static and dynamic tests. For testing point resistance, dwell, mechanispark advance and vacuum advance
4. Motor tester analyzer, facilities for testing battery, starting voltage and current, cylinder compression, intake vacuum, ignition coil, condenser. Complete with tachometer, dwell meter, volt-amp-resistance and combustion tester
5. Power light tester. Synchroscope three lead type for making dynamic ign. timing
6. Spark plug cleaner and tester
7. Head light tester for focusing and adjusting headlight beam
8. Thermometer tester. Fahrenheit scale, glass tube mercury type. Scale 0° to 300° F.

TIRE SERVICE
1. Bead expander to compress crown of tire to force beads of tubeless tire against rim
2. Tire changer with bead breaker and roller
3. Tire gauge
4. Tire tester (water tank)
5. Tire repair kit (Tubeless)

VALVE RECONDITIONING EQUIPMENT
1. Valve refacer, electric. Motor driven grinding wheel. Universal motor driven valve stem chuck, mounted on adjustable feed base. 9/16" capacity, angle adjustment 30° to 90°, 110 V, 60 cycle motors, bench type
2. Valve seat grinder, complete with stones for popular car sizes
3. Valve spring compressor, adjustable for L head engines
4. Valve spring compressor, adjustable for overhead valve engines

WELDING UNIT
1. Portable oxyacetylene welding unit complete with 2 wheel carrier with cylinder holder device. Including: acetylene regulator, oxygen regulator. Torch complete with tips Nos. 0, 1, 2, 3, 4, 6, 8, 10 and cutting attachment. Oxygen and acetylene hoses of 4 ply molded rubber with clamps. Welding goggles, nonmetalic, molded to fit facila contour, eye cups ventilated, adjustable nose band, No. 6, 50mm. safety lens and 50mm. clear protective lens. Fire extinguisher, trigger type, foamite type. (All equip. must be approved by National Board of Underwriters' Lab.)

WHEEL ALIGNMENT EQUIPMENT
1. Test rack with front pit preferred
2. 3-way alignment gauge set for camber, king pin inclination and caster, including adapter sleeve and clamp to fasten on to spindle. Also turning radius plates
3. Toe-in gauge
4. Wheel balancer. Type capable of testing static and dynamic balance of wheel on car

Special Tools

Special tools for servicing such equipment as automatic transmissions, power steering, and like devices should be requisitioned as required. Give complete purchasing specifications. This applies also to special pullers needed for steering wheels and other special tools.

Automotive Parts and Educational Units

This list of automotive parts should be consulted when developing the teaching devices or educational units which the student will use in preliminary training. His work and experience with these units will be of the laboratory type, in preparation for service work in the automotive service course.

These units must be modern, well maintained, and diversified so that the student can receive experience on all types and designs of similar equipment. An amortization schedule on this material is most important.

BRAKE ASSEMBLY — front and rear
Complete assembly including wheel, brake cylinder, linkage, and foot pedal for basic instructional unit on brakes. (Order mechanical hand, hydraulic, disc, etc., types which are used on current model cars.)

CARBURETORS
Current model carburetors used on popular model automobile engines

CHASSIS, AUTOMOBILE
1. Complete chassis with engine, starter, generator, regulator, and ignition system. All warning and electrical devices attached. (Basic instructional element for electrical work of all kinds.)
2. Chassis instructional element for front and rear suspension units, power transmission units including wheels and tires

DIFFERENTIALS
Complete with carrier, axles, and power drive. Order Hotchkiss drive and torque tube types. For assembly and disassembly

DISTRIBUTORS
Order distributors which are currently used on all popular automobile engines. Complete with distributor head, points, condenser, vacuum advance, automatic advance, and lube fitting (for use as basic training elements)

ENGINES
1. 6-cylinder overhead valve engine complete with clutch and transmission, ignition and fuel systems, in operating condition
2. 6-cylinder in line, L head engine complete with clutch and transmission, ignition and fuel systems, in operating condition
3. 8-cylinder V-type engine complete with clutch, transmission, fuel and ignition systems, in operating condition
4. Any type cut away engine
5. Used engines for assembly purposes. To be mounted for dead engine work

FUEL PUMPS
Order fuel pumps used on current engines. Vacuum, mechanical, magnetic, etc.

GENERATORS
1. Order d.c. generators used on current model automotive engines complete with pulley and terminals, 6 and 12 volt types
2. Order a.c. high output generator with d.c. rectifier and regulator (used on automotive two-way communication circuits)

IGNITION COILS
Order coils used on current model automobile engines 6 and 12 volt types (for basic training elements)

IGNITION CONDENSERS
Order condensers used on current model automobile engines (for basic training elements)

REGULATORS
Order 2 and 3 unit regulators complete with volt, current, and cutout coils. In good operating condition (for basic training element)

STARTING MOTORS
Order starting motor types which are used on current model automobile engines. Order complete with starting switch (manual and automatic) and with engaging mechanisms (Bendix and overrunning clutch)

STEERING GEAR ASSEMBLY
Order steering gear assemblies used on current model automobiles, complete with shift-

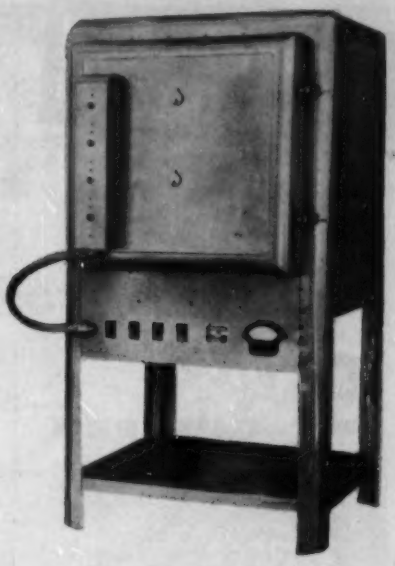
(Continued on page 64A)

You'll like PARAGON KILNS

in your ceramic department

Every year hundreds of art and vocational teachers discover the many advantages of Paragon kilns . . . the ease and simplicity of operation . . . the trouble free performance . . . the range of control to fire each type of clay just as it should be fired . . . the handsome styling and attractive finish.

You'll like the price, too. Quantity production and sales leadership keep manufacturing costs down, and these superior quality kilns can be yours for no more than you would pay for ordinary kilns. Compare before you buy, and you'll specify Paragon.



Paragon front loading kilns feature modern design and advanced engineering. Designed for institutional use, these kilns have every feature the teacher has always wanted, and are amazingly easy to operate. Built in sizes from 1 cu. ft., every kiln is complete, nothing else to buy, and there is never any charge for crating.

There is a Paragon kiln for every school need

The top loading kiln is becoming more popular each year. Department heads appreciate the budget stretching low initial cost, and teachers like the ease of loading and the simplicity of operation. The series S kiln illustrated at left is years ahead of others in design, and is constructed from premium quality materials.

Paragon top loading kilns are available in a wide range of sizes, 3/8 cu. ft. for student groups, 3/4 and 1 1/3 cu. ft. for classroom operation, and other sizes through 6 cu. ft. for vocational and art departments.

LABORATORY TEST KILN

A kiln of a dozen uses! Glaze samples, testing clay, heat treating tool steel, furnace brazing, melting non-ferrous metals. Has pyrometer and control for holding temperature or for regulating heating rate. Heats to 2300° F., only $95.00.

COMPLETE SCHOOL SERVICE

Our fifteen years in schools and ceramics qualifies us to help you with your ceramic problems and to advise you on your equipment and supplies.

We have a complete line of clay, glazes, kilns, wheels, tools and publications. Three large, illustrated catalogs are available: No. 1, Ceramic Supplies and Equipment; No. 2, Plaster of Paris Molds; No. 3, Copper Enameling Equipment and Supplies, complete with instructions.

PARAGON ENAMELING KILNS

The kiln illustrated at left is a heavy duty type for classroom or professional use. It is heated from an enclosed element plate in the bottom for better bonding of enamel and freedom from electrical shock. A big kiln, 12 1/2" square x 4" high, yet priced at only $75.00 as shown.

WRITE FOR COMPLETE PARAGON CATALOG

Seeley's Ceramic Service

7 ELM STREET ONEONTA, NEW YORK

(For more information from advertisers, use the postcard on page 91A)

Specially Designed for Student Safety!

Baldor BUFFERS

Baldor "safety engineered" buffers meet the diversified demands of young, inexperienced hands. Slow speed (1725 RPM) reduces spoilage —makes learning so much *easier . . . faster!* Helps students do better work. Ideal for soft metals, cellulose materials, plastics. Conventional 3450 RPM also available. Feature for feature, no other buffer offers so much.

- Even under extreme and repeated overloads, motors won't burn out
- Flanges, wheels, shafts comply with American Standard Safety Code requirements
- Lubricated for life ball-bearings
- 6", 7", 8" and 10" sizes
- NEMA construction

Write for Bulletin 321P on complete line of Baldor Grinders and Buffers!

BALDOR ELECTRIC CO.
4353 Duncan Ave. • St. Louis 10, Mo.

Ideas unlimited!

Successfully tested and approved for project activities in plastics, ceramics, leather, wood, metal!

New Catalog now available of handsome desk and project accessories — desk fountain pens, desk ball pens and pencils, swivel-funnel-holders, plus many new items.

Combination shown at right priced at $5.70 a dozen up for pen, funnel, swivel, screw.

Gilbert & Miller INC.
104 FOURTH AVE., NEW YORK 16, N.Y.
Pen Makers to the Trade Since 1827

AUTOMOTIVE EQUIPMENT

(Continued from page 62A)

ing lever, wheel, arm, column, and shifting link arms (basic training element). Include power steering types

TRANSMISSIONS

1. Order conventional transmissions used on current model automobiles
2. Order automatic type transmissions used on current model automobiles.

Furniture

The shop furniture should be in keeping with furniture used by other classes in other rooms of the school. Especially in the shop, it's wise to keep furniture painted, varnished, polished, and well cared for.

BENCHES — *see* section on Special Equipment and Testing Devices

BULLETIN BOARD

CABINET

1. Steel supply, 36" x 18" x 72" cabinet, double doors, locking, 4 shelves
2. First aid cabinet, 5" x 12" x 20" steel for first aid supplies, painted white

CHALKBOARD

DESK, TEACHER'S — 5 drawer

FILES — 4 drawer, legal size

FIRE EXTINGUISHER

Approved types according to local building and safety codes

SEATING

Provisions should be made for seating class: tablet arm seats are recommended

PROJECTOR

1. 16mm. sound motion picture projector
2. 35mm. comb. with 2" slide still-projector

SCREEN

6' x 8' beaded screen, tripod or wall mtng.

NEWS NOTES

(Continued from page 56A)

teachers, commercial teaching aids for electricity and electronics, a radio club in action (University High School students), and power mechanics unit.

UNIVERSITY STUDY TOUR

The University of Hawaii has announced a 44-day study tour of Japan, Formosa, Hong Kong, Macao, and Manila for the summer of 1959. The tour will be listed in the 1959 summer school catalog of the University of Hawaii as Asian Studies S320, under the tutorship of Dr. C. K. Cheng, professor of sociology at the University, and will carry five graduate credits. It is open to teachers, students, and mature adults. Participants will depart the Mainland June 9 aboard the *SS President Cleveland* for Honolulu and depart Honolulu on the same ship on June 16 and arrive at Yokohama June 25 for a 17-day study tour throughout cultural Japan.

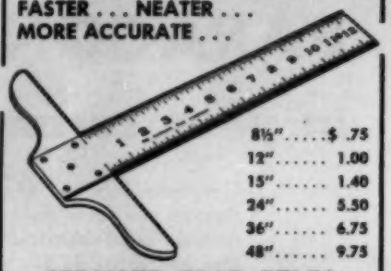
From Japan they fly to Taipeh, the capital city of Formosa and the fortress-refuge of the Chinese Nationalist Government. From Formosa they fly to the British Crown Colony of Hong Kong and visit the new territories which spread to the border of Red China.

The Portuguese Colony of Macao is 40 miles southwest of Hong Kong and the group makes an excursion of this tiny peninsula, the oldest remaining foreign colony in the Orient.

Leaving Hong Kong the group will fly to Manila for a five-day visit of that capital and the Philippine Republic. From Manila, the group will fly back to Honolulu, to the Manoa Campus of the University of Hawaii to wind up the course by August 1st.

Orient Study Tour, 2275 Mission St., San Francisco 10, Calif.

FAIRGATE . . .
GRADUATED T-SQUARES
FASTER . . . NEATER . . .
MORE ACCURATE . . .



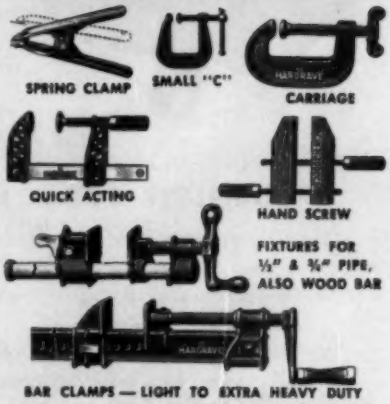
8½" . . . . . $ .75
12" 1.00
15" 1.40
24" 5.50
36" 6.75
48" 9.75

STRAIGHT EDGE RULES

6" . . . . . $ .20
12" 30
24" 1.10
36" 2.25
48" 3.50
60" 4.50

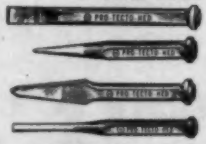
ALL ITEMS
● NON RUST ● STRONG
● ALUMINUM ● LEGIBLE
● LIGHT
COMPLETE LINE • ALL SIZES
CARPENTER'S SQUARE 24" x 16", $3.25
L-SQUARES • TRIANGLES
KNOB RULES • KNOB TRIANGLES
SEND FOR CATALOG
FAIRGATE RULE CO.
COLD SPRING 9, N. Y.

H HARGRAVE
The Complete Line of Tested TOOLS



SPRING CLAMP
SMALL "C"
CARRIAGE
QUICK ACTING
HAND SCREW
FIXTURES FOR ⅛" & ¼" PIPE, ALSO WOOD BAR
BAR CLAMPS — LIGHT TO EXTRA HEAVY DUTY

PRO-TECTO-HED
CHISELS AND PUNCHES



INDIVIDUALLY TESTED
Trip Hammer Forged for Safety
STOCKED BY YOUR LOCAL DISTRIBUTOR
WRITE FOR FREE CATALOG
THE CINCINNATI TOOL COMPANY
Waverly & Main Cincinnati 12, Ohio

JUST OUT!
CRAFTOOLS
NEW
76-PAGE CATALOG

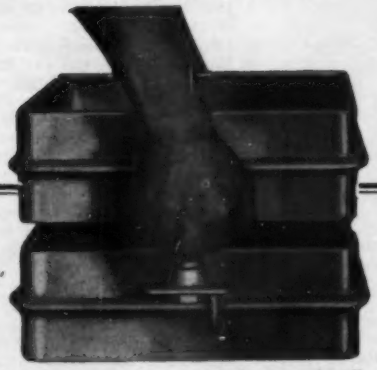
and set of
INSTRUCTIONAL
WALL
CHARTS

Send for your FREE copy showing the complete CRAFTOOLS line of tools and equipment for THE CREATIVE CRAFTS.

- CERAMICS
- GEM CUTTING
- JEWELRY - METAL CRAFT
- GRAPHIC ARTS
- BOOKBINDING
- DUST COLLECTION
- CRAFT BENCH & RACKS
- WOODCARVING & SCULPTURE

CRAFTOOLS, INC.
Dept. IA, 396 Broadway, New York 13, N. Y.

USE STERLING STEEL FLASKS
FOR *Easy Handling*



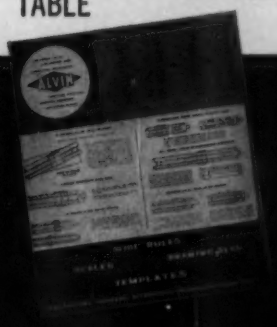
Sterling Style "E" Flasks

You'll find Sterling Style "E" Flasks exceptionally easy to handle because pin lugs are combined with handles. In many foundries, these Style "E" Flasks have replaced snap flasks. They prevent runt outs . . . require less sand. Sterling Steel Flasks combine maximum strength with minimum weight. They retain their rigidity and accuracy, year-in, year-out. Write for Sterling Catalog.

STERLING NATIONAL INDUSTRIES, Inc.
Founded 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U.S.A.

A MUST FOR EVERY TEACHER

Now Available!
FREE!
NEW ALVIN
READY REFERENCE
CHART With
DECIMAL
TABLE



ALVIN

America's Most Complete Line Of

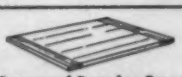
- DRAWING SETS
- DRAFTING INSTRUMENTS
- DESIGNING AIDS
- DRAFTING MATERIALS
- DRAWING EQUIPMENT
- MEASURING DEVICES

If you buy or specify drafting materials and drawing instruments, write for this handy Ready Reference Chart with convenient decimal table. Here's a fully illustrated Reference Chart showing the complete Alvin line. Makes a handy buying reference for mechanical and architectural drawing teachers. Can be tacked on a wall for students' reference. For your free copy write to Alvin . . . . Today!

HERE'S A FEW OF OUR STUDENT SPECIALS

Star Drawing Pencils
No. 3054 Retail $.90 doz.

"T" Square
No. C-18 — Retail $2.75



Basswood Drawing Board
No. DB111-Retail $1.90

Triangular Scale
No. 210-Retail $.90

Scholastic Drawing Set
No. 912 Retail $8.00

Special Educational Discounts
To All Schools And
Industrial Arts Instructors
FREE ACHIEVEMENT AWARDS
On Orders Exceeding $75.00

"QUALITY AT THE RIGHT PRICE"
ALVIN & CO., INC. Windsor, Connecticut

MAIL THIS COUPON TODAY!

Alvin & Co., Inc.
Windsor, Connecticut

Please send me the FREE 1959 Alvin Ready Reference Chart.

Name.....Position.....
School.....
Address.....
City.....Zone.....State.....

(For more information from advertisers, use the postcard on page 91A)

Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent and sound movies may be used by the students in the industrial arts and vocational education courses.

BELLOWS
1. Hand, small size
2. Electric, blower type

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
1. Bench
2. Benzine, No. 1, oval black
3. Floor
4. Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
1. Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
2. Galley, for 8¾ by 13 in. galleys, wood or steel, four tiers
3. Ink and roller, to accommodate platen-press rollers, wood or steel
4. Matrix, for use with typesetting machines only
5. Roller, cabinet or rack for cylinder rollers
6. Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
7. Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copy holder
8. Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
9. Type, complete with 24 full-size California job cases, double work bank, wood or steel
10. Wood or metal, for filing class records, instruction sheets, etc.
11. Storage for cuts

CANS
1. Benzine, pint size
2. Benzine, 5-gal. size
3. Kerosene, safety, 1-gal. size
4. Waste can, fireproof, for rags

CASES
1. Blank, full-size, to accommodate ¼-size cases
2. Border, ¼-size, for ornamental borders
3. Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
4. Metal furniture, to hold labor-saving fonts
5. Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CHASE RACKS
1. For platen presses
2. For cylinder presses

CHASES
1. For each size of platen press
2. For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
1. Lead and rule
2. Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
3. Paper, lever type, 26 or 30 in.
4. Paper, lever type, 30 in., with divided back gauge
5. 30 in. to 36 in. power cutter

DESK
1. Bindery, 80 by 36 in.
2. Drying rack
3. Imposing, 51 by 39 in.
4. Make-ready, 32 by 24 in.
5. Paper cutters', 80 by 36 in.
6. Proofreaders'
7. Teacher's

DRYING RACKS
1. Combination drying rack and stock table for platen presses, 30 trays
2. Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¾ by 13 in., 6¾ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
1. 12 by 18 in., with iron top, including reglets and furniture
2. 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
3. 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
4. 39 by 63 in., with iron top, complete with drawers, letter boards, reglets, and furniture

INK FOUNTAINS
1. Short, for 8 by 12, 10 by 15, and 12 by 18 presses
2. Long, for 10 by 15, and 12 by 18 presses

KNIVES
1. Overlay, for make ready
2. Ink, 6 and 8 in.
3. Ink, 8 in., square end

LEADER BOXES

LEADERS
1. 6, 8, and 10 pt., fine dot
2. 8 and 10 pt., hyphen

LINE GAUGES
1. Metal, brass, or steel
2. Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
1. For use on presses
2. Hand machines

ORNAMENTS
1. Assorted floral and decorative designs
2. Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
1. 24-in., foot treadle
2. 28-in., foot treadle

PLANER
1. Mallets, hickory or fiber
2. Proof, maple, with felt bottom
3. Type, maple with leather top

PRESSES
1. Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
2. Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
3. Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
4. Platen, 12 by 18, complete with variable-speed motor, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
5. Proof, 14 by 18, with cabinet
6. Proof, 20 by 24, with cabinet
7. Proof, 23 by 24½, with cabinet
8. Tableting

PUNCH
1. Foot power, multiple with assorted punches
2. Lever, two die, with assorted punches
3. Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
1. Sizes No. 1 and No. 2
2. Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
1. 2 pt., laborsaving, hair line, side face
2. 2 pt. laborsaving, 1 pt. side face
3. 1 pt., laborsaving, 1 pt. face
4. 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
1. Iron furniture, as selected
2. Leads, laborsaving, 2 pt.
3. Leads, 2-ft. strips, 2 pt.
4. Slugs, laborsaving, 6 pt.
5. Slugs, 2-ft. strips, 6 pt.
6. Spaces and quads
7. Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type, foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ or ¾ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
1. 18 in.
2. 38 in., upright, to be used with cylinder press only

TYPE
1. Body lightface — 8 and 10 pt.
2. Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
3. Job lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
4. Job boldface — 6 and 8 pt., 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
5. Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
6. Job condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
7. Job text type — 10, 12, 14, 18, and 24 pt.
8. Job, typewriter type — 12 pt. with spaces
9. Job, boldface italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
10. Job, heavy copperplate Gothic — 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
11. Wood, condensed Gothic — 8, 12, 15, and 18 line
12. 10 pt. line leaders 4 dots to the em
13. 10 pt. braces and dashes
14. 10 pt. fractions
15. 10 pt. references
16. Parentheses and brackets
17. 2 pt. laborsaving leads, 4 to 25 picas
18. 6 pt. laborsaving slugs, 4 to 25 picas
19. 2 pt. laborsaving brass rule
20. 2 pt. miters for rule
21. Laborsaving metal furniture
22. Thin spaces and quarter-size case

TYPESETTING MACHINES
1. Either linotype or intertype, 2 or 3 magazines, and molds
2. Matrices for same, 6, 8, 10, and 12 pt., as selected

VISUAL AID CHARTS

Print-Shop Supplies

BENZINE OR GASOLINE — for cleaning type or presses

BINDERY TAPE — 2 in. wide, brown or black

GOLD BRONZE — pale

INK
1. Bond, black, for bond papers
2. Book, black, for school papers, etc.

3. Cover, colors as selected
4. Dryers and compounds, as selected
5. Half tone, black
6. Job, colors as selected
7. Metallic, gold and silver
8. Process, black, red, yellow, blue

KEROSENE — for cleaning rollers

PADDING CEMENT
1. Cold
2. Hot

PAPER
1. Bond, fine grade, 17 by 22 — 20, white
2. Bond, medium grade, 17 by 22 — 20, white
3. Bond, sulphite, 17 by 22 — 20, white
4. Bond, sulphite, 17 by 22 — 20, colors as selected
5. Book, enamel, 25 by 38 — 80, white
6. Book, machine finish, 25 by 38 — 80, white
7. Book, eggshell finish 25 by 38 — 60, white
8. Cover, as selected, 20 by 26, medium
9. Card Bristol, fine grade, 22 by 28 — 4 ply, white
10. Index Bristol, medium grade, 25½ by 30½ — 110, white
11. Index Bristol, medium grade, 25½ by 30½ — 140, white
12. Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
13. Pressboard, red
14. Strawboard, No. 40 or No. 50
15. Tagboard, manila, 24 by 36 — 140
16. Tympan, to fit presses
17. Wrapping paper, size as selected
18. Holder for same

PASTE
1. Bindery
2. Make ready

SILK-SCREEN SUPPLIES consisting of:
1. Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white, and black
2. Solvent profilm in 11- by 14-in. sheets
3. 8-in. synthetic squeegee
4. 11-in. synthetic squeegee
5. No-clog varnish
6. Film solvent
7. Stencil filler
8. Filler remover
9. Stencil knife
10. Fiber guides
11. Red sable brush — ½ in.
12. Putty knife
13. Frame tape

TWINE — cotton, for tying jobs

WIRE STITCHING
1. No. 28 round wire for stitcher
2. Wire staples, ¼ in.

Descriptive Material

"ELMER'S GUIDE TO GOOD GLUING"

The Borden Company announced the publication of a new 16-page, four-color booklet titled "Elmer's Guide to Good Gluing." It is being offered at no cost to home handymen, school shop students, and others interested in selecting the right glue for every job they do.

The booklet covers all-purpose adhesives, contact cements, waterproof glues, plastic resin glues, and casein glues, outlining uses for each and explaining how they are to be applied. A special two-page glue chart summarizes the information, listing various gluing jobs, requirements of the adhesives to be used, and recommending the specific glue for the job.

(Continued on next page)

"Worth its Weight in Textbooks!"

Mr. William Cole, mechanical drawing instructor at Abraham Lincoln High School in San Francisco, is a firm believer in textbooks. But he also recognizes the invaluable practical training his students are getting through use of their Bruning Copyflex Model 300 reproduction machine.

Right in the class room, students make sharp, black-on-white diazotype prints in seconds of their drawings or tracings — up to 30-inches wide by any length. They learn for themselves how their drafting board work effects the sharpness and clarity of prints. They gain valuable experience with all of the drafting and reproduction techniques involved with such materials as intermediates and film overlays. In short, Mr. Cole's students are getting *today* the whiteprinting experience and benefits they'll utilize *tomorrow* in industry!

You owe it to yourself and your students to investigate the remarkable Copyflex "300". It offers all the versatility and big printing width of a large, expensive diazotype reproduction machine — at a price to fit school budgets. Moreover, the "300" can be utilized for fast, labor-saving reproduction of student transcripts and a wide variety of records, reports, charts, and memoranda. Why not mail the coupon right now for more information?

Bruning Copying Equipment Has Been Selected for Special Exhibition in SCHOOLROOM PROGRESS U. S. A.

BRUNING Copyflex

Send for Your Free Copy!

Charles Bruning Company, Inc., Dept. 3-ZZ
1800 Central Rd., Mt. Prospect, Ill.
In Canada: 105 Church Street, Toronto 1, Ont.

☐ Please send me my free booklet on Copyflex Model 300.
☐ Please have your local representative call on me.

Name _____ Title _____
Company _____
Address _____
City _____ County _____ State _____

(For more information from advertisers, use the postcard on page 91A)

DESCRIPTIVE MATERIAL

(Continued from previous page)

Included in the booklet are sections on tips on wood gluing, clamps and jigs and how to use them, when to use nails, plugs, and screws, and it lists many unusual uses for adhesives in the home.

(For further details encircle index code 0315)

BROWN & SHARPE ILLUSTRATED BOOKLET

Brown & Sharpe Manufacturing Company, Industrial Products Division, has issued a new, illustrated booklet, which shows the latest developments in its line of precision tools. It is Bulletin M81.

The items included are entirely new in concept or advanced designs of personal and shop tools designed to provide greater accuracy and easier use then heretofore available. Featured are convertible thimble micrometers with a range from 0 to 1 inch by .0001 in.; height gauges with new versatility and stability; a Super Hite Chek, self-contained transistorized unit that reads in 25 millionths; tool setting gauges; edge finders; radius gauges; sine plates; dial snap and bore gauges; permanent magnet chucks; and precision ground tool steel. Specifications and prices are also included.

(For further details encircle index code 0316)

HALLOWELL SCHOOL SHOP FURNITURE

Columbia-Hallowell Division of Standard Pressed Steel Company have presented capsule reviews of their complete line of Hallowell steel school-shop furniture in a new four-page illustrated bulletin now available.

Meeting a wide range of school-shop needs the equipment ranges from wood- or steel-topped workbenches in a variety of types to revolving-seat adjustable stools for draftsmen; from drawing board cabinets and shop tables to quick-change Erectomatic (bracket-type) shelving and vertical racks for lumber and metal storage.

The abbreviated reference guide also serves as a bibliography to other SPS bulletins on items pictured.

Also given in this shoppers' guide bulletin are data on finish, accessories offered, and general shipping information.

When writing, ask for a copy of Form 2450.

(For further details encircle index code 0317)

NEW 8-PAGE SPS BULLETIN

Columbia-Hallowell Division of Standard Pressed Steel Company have issued a new bulletin — Form 2451 — which gives brief descriptions and specification information on the various types and models of Erectomatic shelving which they offer for open, closed, bin units, ledge units, cabinets, or counter use for the industrial plant or the laboratory.

The Erectomatic shelving is designed around a simple thumb-operated locking device which makes shelf changes a matter of seconds. Savings of as much as 20 per cent of storage space costs are possible through fuller shelf utilization and frequent adjustment to meet changing needs.

Quick initial erection and beaded-post design permitting straight-in-and-out shelf repositioning are added features cited.

The heavily illustrated eight-page bulletin underscores these and other Erectomatic shelving features with sequence photos, showing step-by-step shelf-changing procedure which requires no tools.

(For further details encircle index code 0318)

DI-ACRO ROLLERS — SPARTAN SERIES

O'Neil-Irwin Manufacturing Company have issued a 2-page descriptive circular which highlights the Di-Acro rollers for the school shop. Along with a full description of the new Spartan Roller which includes pertinent information on maximum forming widths, material capacity, minimum and maximum radius, diameter of rolls, weight and cost, are shown and described their other precision metal-working machines. These include Di-Acro Benders, Di-Acro Box and Pan Brake — Spartan Model 24, Di-Acro Notcher — one model, Di-Acro Press Brake — one model, and Di-Acro Shears — four models to 24 in.

Stands as accessory items for all Di-Acro Rollers are offered also.

Ask about Di-Acro "package deals," the economical way to set up a balanced metal-working shop.

(For further details encircle index code 0319)

SAMS PUBLICATIONS ANNOUNCED

Auto Radio Manual, Volume 8. Catalog No. AR-8, 240 pp., 8½ by 11 in., $3.95.

Volume 8 is the newest addition to the Auto Radio Manual Series. It provides complete Photofact service data coverage on 48 models of 1957–58 auto radios. A cumulative index lists all models covered in the series since 1953.

Know Your Oscilloscope, by Paul C. Smith. Catalog No. KOS-1, 160 pp., 5½ by 8½ in., $2.

The latest addition to the Sams line of books on test equipment, it contains the very latest information on this versatile and valuable test instrument. Time-saving tips, new ideas and methods, and quick reference all bring to the reader a more complete under-

(Continued on page 72A)

from
STACOR
... new functional units
for your school

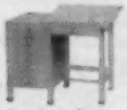
THE FLEX-MASTER MULTI-STUDENT
LIFETIME QUALITY
INDIVIDUALIZED DRAWING UNIT DU-1200

provides horizontal board storage facilities for 12 students

● Efficient ● Space-saving
● Economical ● Private

● Drawers have individual locks, masterkeyed . . . hold boards up to 20 x 26 in horizontal position plus tools, other material.

for 10 students the DU-1000


for 9 students the DU-900

for 7 students the DU-700

for 6 students the DU-600

8-drawer cabinet unit the DU-800

5 drawer cabinet-unit the DU-500

free-standing unit for 12 the NL-1200

Also available free-standing unit for 7 the NL-700

Write TODAY for complete NEW catalog. Dealer inquiries invited.

Manufacturers of Lifetime Quality School, Drafting & Library Equipment

Stacor ● Since 1932

STACOR EQUIPMENT CO.
277 Emmet Street ● Newark 5, New Jersey ● Bigelow 2-6600

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

(For more information from advertisers, use the postcard on page 91A)

30,000,000 ENVELOPES

IN STOCK

OVER 700 STOCK STYLES and SIZES of
COIN • CATALOG • COMMERCIAL • CLASP
BARONIAL • and SPECIALTY ENVELOPES

LARGEST "OFF-THE-SHELF" SERVICE IN THE MIDWEST

Manufacturers & Printers of Envelopes for Schools, Printers, Lithographers, Publishers, Stationers, and Industry

●

WESTERN STATES ENVELOPE COMPANY

1616 WEST PIERCE STREET • MILWAUKEE 46, WISCONSIN

T. A. FOLEY LUMBER CO., INC.

We have completely rebuilt our plant to produce better lumber and to process your orders more efficiently.

Send your specifications for lumber, plywood and dowels for direct quotation.

■

Drawer #336 Paris, Illinois

UPHOLSTERY SUPPLY CO.
SCHOOL SHOP DIVISION

DISTRIBUTORS OF

CINCINNATI CLAMPS
STANLEY TOOLS
BORDEN GLUES
GREENLEE TOOLS
M. L. CAMPBELL CO. FINISHES
COLUMBIAN VISES
BEHR-MANNING ABRASIVES
and many others

Write for: FREE 180 PAGE CATALOG "L"

***Everything* for the School Woodshop**

Thousands of Shop instructors use Catalog "L" to procure at *wholesale all woodshop supplies* such as Special Finishing materials Abrasives — Glues — Fasteners and Furniture hardware of all kinds. We have what you need to make *any* wood project, from *show case to shoe box*, and all at our Special 50% discount to Schools!

The UPHOLSTERY SUPPLY CO.
1033 N. FOURTH ST. • MILWAUKEE 3, WIS.

(For more information from advertisers, use the postcard on page 91A)

SHOP EQUIPMENT NEWS

(Continued from page 68A)

Two hooks on the back of the unit are designed for easy storage of the heavy-duty, 8-foot electrical cord.

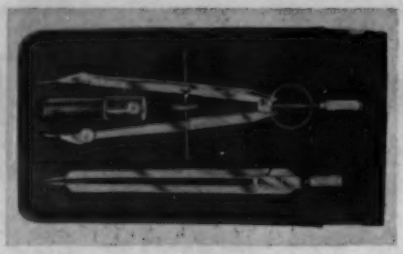
Further information on the new Kodak 4-Lamp Movie Light (Model 1) is available.

(For further details encircle index code 0310)

ALVIN POCKET DRAWING KIT

Alvin & Company, Inc., announces an all new all-round basic Drawing Kit, easy to carry in a pocket for finger-tip availability in classroom, general shop, or drafting department.

The drawing kit contains the two basic instruments necessary for layouts and measuring. Full 6-in. bow compass and 5½-in. friction divider are sturdily constructed with polished nickel finishes.



Alvin Pocket Drawing Kit

Both instruments and spare parts tube with an extra divider needle come in an attractive vinyl plastic case with black satin finish. This 6¼ by 3½-in. case is fitted with pocket flap. All-round double stitching assures added protection against wear. Convenient pocket in rear of case provides additional storage for cards, pencils, pocket scales, and rules.

The new Alvin Pocket Drawing Kit is catalogued No. 608K.

(For further details encircle index code 0311)

DIRECT-READING CALIPER

The Drumcliff Company have introduced a new Direct-Reading Caliper, useful to machinists, model makers, inspectors, and draftsmen, as well as hobbyists and home craftsmen.

Direct-Reading Caliper

It measures round or flat objects and irregular shapes up to 4 in. thickness quickly and with complete ease and accuracy.

Its 0–4 inch black-on-white large, easy-reading scale is precisely calibrated in inches by 32nds. A squeezing handle opens the caliper, a spring gently closes it on the work. Long curved legs reach over flanges and other obstructions, and measures thickness of sections up to 3 in., in from the edge of a part. Precision tips can penetrate to the bottoms of grooves and slots only 1/10 in. wide. It can also be used as a gauge by locking set screw at any position on the scale.

(For further details encircle index code 0312)

EICO SPEAKER SYSTEM IN THREE FINISHES

Electronic Instrument Company, Inc., has made its EICO Model HFS-2 Speaker System available in three finishes: mahogany, walnut, and blonde.

EICO Model HFS-2 Speaker System

The HFS-2, completely factory built, is ideal for stereo applications because of its omni-directional dome-shaped sound spread.

(Continued on page 72A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

THINKING OF A NEW OR EXPANDED ELECTRIC SHOP?
flexlab electric supply and distribution equipment
FOR HIGH SCHOOL ELECTRIC SHOPS
PUBLICATION NO. 244
STANDARD
THE STANDARD ELECTRIC TIME CO.

HERE'S INFORMATION YOU'LL WANT IN YOUR PLANNING

STANDARD'S new 16 page catalog itemizes typical electric shop requirements, illustrates a suggested shop layout and provides complete general specifications for a voltage distribution system. This valuable work book also illustrates and describes STANDARD's famous line of Flexlab® equipment, including

- √ Switchboards
- √ Enclosures
- √ Motor-Generators
- √ Dynamometers
- √ Service Outlets
- √ Accessory equipment such as
  - Extension Cords
  - Emergency disconnects
  - Nickel cadmium storage batteries

Request Publication No. 244 today.

75 Years of Progress — *Pioneer in 1884 — Leader in 1959*

THE STANDARD ELECTRIC TIME COMPANY

89 LOGAN STREET • SPRINGFIELD, MASSACHUSETTS

Now ready!

Giant 1959 edition of Chilton's AUTO REPAIR MANUAL

Widely used in Army-Navy training, in leading schools and colleges in 48 states, this 30th edition contains 250,000 facts, over 1,000 pages of pictures, diagrams, charts, cutaway views, clear instructions. Covers all 23 leading makes and all models of cars from 1949 to 1959.

$7.95

AUTOMOBILE ENGINE REBUILDING and MAINTENANCE

By Harold T. Glenn

Specifically designed for vocational-technical courses, this new book provides on-the-job training for students of auto machining and auto mechanics. 466 work-in-progress illustrations. Size 6⅛" x 9¼".

$6.95

CHILTON CO.

Book Division

56th and Chestnut Streets

Philadelphia 39, Pa.

AUTOMOTIVE JOB SHEETS

Complete, step-by-step procedure for Vocational and Technical Schools — illustrated, and with Teacher's Manual and Sourcebook. Write for complete details and illustrated brochure.

IMPORTANT MESSAGE TO

PLASTIC CRAFT TEACHERS!

COPE PLASTICS (formerly D. W. Cope Plastics) is proud to announce that we are now operating from our brand new warehouse and plastics fabricating plant. Increased floor space, a greatly expanded inventory, an improved method of handling orders enables us to offer you IMMEDIATE SHIPMENT of PLASTICS FOR EVERY CLASSROOM NEED!

If you want to SAVE TIME, SAVE BOTHER, to enjoy the convenience of obtaining the plastic needs of your students from ONE DEPENDABLE SOURCE — check off your requirements on the following list then write for COPE'S 1959 PLASTICS CATALOG and buying guide, and schedule of school discounts.

- ☐ Plexiglas, clear & colored
- ☐ Lucite Tubing & Rods
- ☐ Cellulose Acetate
- ☐ Styrofoam
- ☐ Adhesives, Buffing Wheels & Compounds
- ☐ Dyes, Blending Granules, Filling Plaster for Internal Carving
- ☐ Jewelry Findings
- ☐ Fiberglas-Polyester Resins
- ☐ Carving Tools, Drills
- ☐ Tenite II Screw Driver Handle Stock
- ☐ Castolite Liquid Casting Plastic
- ☐ Electric Ovens
- ☐ Salvage Material
- ☐ Plastic Lacing, Cord, Ribbon & Belting

FREE! Instruction sheets for making Decorative Fiberglas Bowls and Internal Carvings for distribution to students. Write on School letter-head stating quantity of each you need.

COPE PLASTICS Dept. H

Highway 100 **Godfrey, Illinois**

"Just Across the Mississippi from St. Louis"

ALL NEW, COMPLETE CATALOG OF

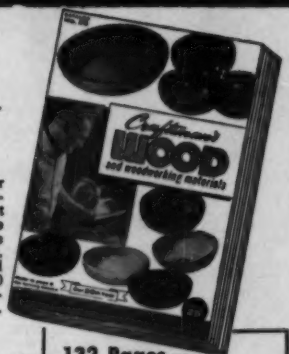
WOOD & WOODWORKING EQUIPMENT

FREE TO INSTRUCTORS

New 1959 Edition . . .

Finest Domestic and Rare Woods . . . Molding . . . Tools. . . . Imported Ceramic Tile

ALL AT LOWEST PRICES



INSTRUCTORS! Just mail coupon for your FREE COPY (25c to students, refundable with first order) of our giant new 1959 woodworking catalog. We are America's largest source of fine domestic and rare imported woods for projects. Also bandings, veneers, inlays . . . all shown in full color. Includes over 250 scroll patterns. See newest tools, equipment and hard-to-find cabinet hardware. Rush your request today!

CRAFTSMAN WOOD SERVICE
2729 Mary St., Dept. F-3, Chicago 8, Ill.

CRAFTSMAN WOOD SERVICE COMPANY
2729 Mary St., Dept. F-3, Chicago 8, Ill.

INSTRUCTORS: Send new WOODWORKER'S HANDBOOK — FREE (enclose 25c if student, refunable with your first order.

Name .....

Address .....

City ..... Zone ..... State .....

132 Pages —

- . . . many in full color . . . newest project ideas
- Embossed mouldings, carved ornaments, matched plywoods and veneers
- Complete lines of archery and upholstering supplies
- New! Blanks for baseball bats, snow skis, complete water ski kit
- New! Hardware for baby cribs, typewriters, folding legs
- Many new woodworking tools
- Same day shipment; guaranteed satisfaction

(For more information from advertisers, use the postcard on page 91A)

FOUNDRY SUPPLIES

MOLDING SAND
STEEL FLASKS
INGOT METAL
CRUCIBLES
CRUCIBLE TONGS
FLUX - RAMMERS
MOLDERS' TOOLS
PATTERN LETTERS
PYROMETERS
GLOVES - APRONS
LEGGINGS - ETC.

•

FAST MELTING
" SPEEDY MELT"
FURNACES

"Speedy Forge" Gas Forges

•

.. WRITE FOR LITERATURE ..

WESTERN MATERIALS COMPANY
19 SOUTH LA SALLE STREET
CHICAGO 3, ILLINOIS
Equipment Division
W M

PERFECT
MATS
EVERY TIME

X-acto® MAT
AND BEVELER
KNIFE GUIDE

Precision cutting up to 30". Makes both perpendicular and beveled cuts. Made of light magnesium. Easy to use. Complete with No. 6 knife and instructions. $9.00

FREE art tool folder.

X-ACTO, INC.
48-95 Van Dam Street
Long Island City 1, N. Y.

SHOP EQUIPMENT NEWS

(Continued from page 70A)

Focusing of two HFS-2's is *not* necessary, nor are they required to sit in any place in the room.

Further information available on request.

(For further details encircle index code 0313)

PORTABLE BALDOR D5 DUST COLLECTOR

The Baldor Electric Company, manufacturer of electric motors, grinders, buffers, and dental lathes, has announced a new portable Baldor D5 Dust Collector.

Portable Baldor D5 Dust Collector

An outstanding feature of the new dust collector is its ½ h.p. Baldor motor that, combined with a larger blower, provides unusually strong suction that draws even the heaviest particles into the bag or tray. It protects operators' health by keeping the air clean at all times, and it can collect enough precious metal particles to pay for itself in a short time.

It is 7 in. wide, 12½ in. high, and 9½ in. front to back (13½ in. with hood). It fits any standard workbench, and is equipped with handle for easy carrying from one wheel to another. Its weight is 25 lb.

Unusually quiet operation, totally enclosed, capacitor run type motor, with lubricated-for-life ball bearings, it never requires any maintenance. It can be used with any make of bench-type lathe.

More complete information is available.

(For further details encircle index code 0314)

DESCRIPTIVE MATERIAL

(Continued from page 68A)

standing of the oscilloscope and its practical applications.

Record Changer Manual. Volume II. Catalog No. RC-11, 160 pp., 8½ by 11 in., $2.95.

This is the newest addition to the Record Changer Manual series. Volume 11 provides complete Photofact service data coverage of 40 models of 1957–58 automatic record changers. Brand names covered are: Admiral, Collaro, Glaser-Steers, Monarch, Perpetuum-Ebner, RCA Victor, Sylvania, V-M, and Zenith.

101 Ways To Use Your Sweep Generator, by Robert G. Middleton. Catalog No. TEM-1, 144 pp., 5½ by 8½ in., illus., $2.

Here is an extremely practical guide to the multiple applications possible with a sweep generator. Methods and procedures are cov-

(Continued on page 76A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

PLAY IT SAFE... *with the*
GS No. 9000 GOGGLE

No. 9000 — Clear No. 9100 — Green

FOR SHOP AND LABORATORY

This featherweight one-piece goggle fits all faces — men and women alike. Optically perfect and molded to .060" thickness, lenses are impact-resistant and afford protection for light grinding, spot welding, and other semi-hazardous operations. May be worn over prescription glasses. Handsome styling ends complaints about ugly, cumbersome goggles — everyone will want to wear them!

PRICES FOR NO. 9000 AND NO. 9100:

1 to 11 doz.	12 to 35 doz.	36 doz. or more
$7.20 per doz.	$6.60 per doz.	$6.00 per doz.

OPEN ACCOUNTS INVITED

For Everything in Saftey Equipment,
Write for Catalog #10

GENERAL SCIENTIFIC EQUIPMENT CO.
7516 Limekiln Street
PHILADELPHIA 50, PA. HAncock 4-1550

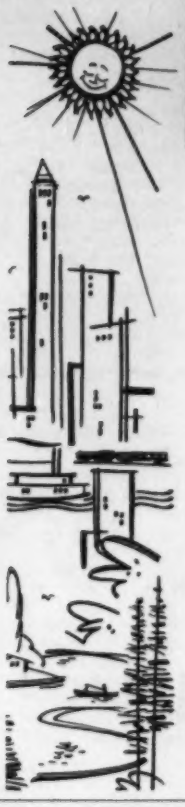
TRAIN
with
INDUSTRY
ACCEPTED
TOOLS

W&B

You won't go wrong training your shop students with Whitman & Barnes tools. They have wide acceptance throughout industry because of their high quality and top job performance. Test them in your shop . . . you'll like them. Contact your W&B distributor for complete tool line selection.

INSTRUCTORS:
Teaching aids are available to you upon request. These include wall size drill applications chart; decimal equivalents charts . . . pocket, desk or wall size . . . and booklet on "Drill and Reamer Facts" covering design, use and care of drills and reamers.

WHITMAN & BARNES
"Makers of Fine Tools Since 1848"
40105 PLYMOUTH ROAD
PLYMOUTH, MICHIGAN
NEW YORK • CHICAGO • LOS ANGELES



Minnesota SUMMER SESSION

SPECIAL COURSES IN INDUSTRIAL EDUCATION

FIRST TERM June 15 - July 18 • **SECOND TERM** July 20 - August 22

More than 1,000 courses
GRADUATE and UNDERGRADUATE
with emphasis on
ADVANCED STUDY, PROFESSIONAL INSTITUTES, and WORKSHOPS

Facilities of highest quality
LIBRARY, LABORATORY, and RESEARCH

Music, lectures, plays, museums—golf, tennis, swimming, fishing
RECREATION—

For Bulletin write
Dean of Summer Session
913 Johnston Hall

UNIVERSITY of MINNESOTA
MINNEAPOLIS 14, MINNESOTA

WAYNE STATE UNIVERSITY

1959 Summer Session Beginning June 22 for Six, Eight, or Ten Weeks

Study Industrial Technology, Methods, and Philosophy at a University located in the Heart of Michigan's Industries
Co-operative Work-Study for Undergraduates
Field Trips to Study Modern Industrial Processes
Detroit Area Schools and Industries used as Laboratories

Nationally Recognized Doctoral Program in Industrial Education

- Summer Tuition Scholarships for Out-of-State Students
- Financial Assistance during Resident Period
- Excellent Departmental, Library, and Research Facilities
- Low-Cost Living Accommodations on Campus
- Optimum Placement Opportunities

Write to: Dept. of Industrial Education
College of Education
Wayne State University
Detroit 2, Michigan

1959 SUMMER SESSION

INTERSESSION June 8-July 3 • **SUMMER SESSION** July 6-August 14

POSTSESSION
August 17-September 11

PROFESSIONAL AND TECHNICAL COURSES IN VOCATIONAL EDUCATION

INDUSTRIAL ARTS EDUCATION — **ARTS AND CRAFTS**
OCCUPATIONAL THERAPY — **AERONAUTICAL EDUCATION**
VOCATIONAL REHABILITATION

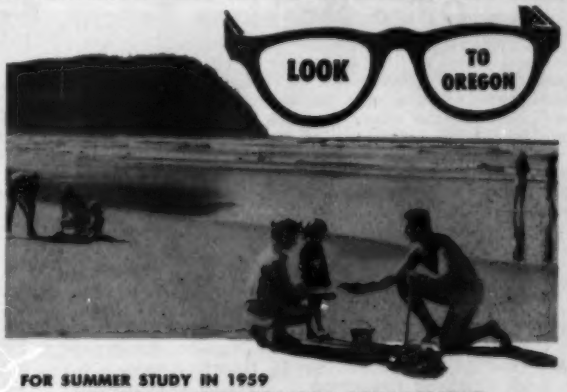
(Classroom Activites Combined with Laboratory Experiences)

•

GRADUATE AND UNDERGRADUATE COURSES leading to DOCTOR'S, MASTER'S AND BACCALAUREATE DEGREES including SIXTH-YEAR PROGRAM

•

For information and complete Bulletins, write to
VOCATIONAL EDUCATION, Dept. SS-2,
School of Education
NEW YORK UNIVERSITY
WASHINGTON SQUARE, NEW YORK 3, NEW YORK



FOR SUMMER STUDY IN 1959

OREGON STATE COLLEGE DEPARTMENT OF INDUSTRIAL EDUCATION

SUMMER SESSION June 22-August 14, 1959

TECHNICAL COURSES: All usual courses in Woodworking, Metal Working, Drafting and Design, plus advanced work in Metal Spinning, Recreational Handicrafts, Metalcrafts, Lapidary.

PROFESSIONAL COURSES: For IA majors Project Design Seminars; School Shop Planning; professional workshops in Leathercraft, Plastics, Electronics, Visual Aids, Course Construction, I.A. Supervision, Shop Safety, Industrial Arts for Upper Grades.
For T&I Majors—Course Construction, Coordination Techniques, Guidance, Public Relations; Seminars in Curriculum, Manpower Trends, Current Technologies.

GENERAL EDUCATION COURSES include guidance and counseling, audio-visual education, school administration and all related areas.

Graduate or undergraduate work under competent resident and visiting instructors, amid scenic wonders—national parks, Pacific beaches, mountains, trout streams, lakes—in a genuinely stimulating climate. Attend the Oregon Centennial Exposition. A summer you will enjoy!

The student may plan a program which, through successive summers at this widely recognized school, will lead to a bachelor's or master's degree. Approved programs carrying the recommendation of Oregon State College are accepted by all state departments of education for either a Special or a General Secondary Credential.

Correspondence invited. Write to:
Dept. of Industrial Education
OREGON STATE COLLEGE
Department C, Corvallis, Oregon

Authorized by OREGON STATE BOARD OF HIGHER EDUCATION

(For more information from advertisers, use the postcard on page 91A)

Ceramic Equipment, Tools, and Supplies

AUTOMATIC CONTROLS
1. Electronic temperature controls
2. Time controls

BATS
Plaster of Paris

BENCH WHIRLERS
1. Aluminum
2. Plastic
3. Setstone bats for whirlers

BOOKS

BRUSHES
1. Camel's hair
2. Squirrel
3. Fine red sable
4. Glaze

CELLOPHANE BAGS FOR STORING GREENWARE

CREAM-INK

CERAMIC DECALS

CERAMIC PENCILS

CHEMICALS
1. Feldspar
2. Flint
3. Gum arabic
4. Kaolin
5. Kiln patching cement
6. Kiln wash
7. Metallic oxides
8. Opax
9. Plaster of Paris
10. Plaster separator
11. Silicate of soda
12. Soda ash
13. White lead
14. Whiting
15. Zircopax

CLAY
1. Red modeling
2. White modeling
3. Fine white flower making clay
4. Porcelain

CONES — Pyrometric, 08–04 standard or junior; 020–018 standard or junior

CROCKS
1. 1-gal. size for glazing with covers
2. 5-gal. size for clay storage with covers
3. 10-gal. size for clay storage with covers

DAMP CABINET — old refrigerator or shop made

FETTLING KNIVES

GLAZES
1. Art
2. Crackle
3. Cold
4. Overglaze, various colors
5. Platinum
6. Under and overglaze mediums
7. Underglaze, various colors
8. Luster
9. Majolica
10. Matt

JARS — Pint and quart for storing glazes
1. Plate rack
2. Posts
3. Spurs
4. Standard stilts
5. Star stilts
6. Tile setters
7. Triangles

KILNS

KILN SHELVES
1. Full
2. Part

MODELING TOOLS
1. Boxwood
2. Fine-art plaster working
3. Lace tools
4. Moss decorator
5. Plaster
6. Sgraffito
7. Slip tracers
8. Wire loop

PITCHERS
1. Large — slip pouring
2. Small — glaze pouring

PLASTER-OF-PARIS MOLDS
1. Animals
2. Ash trays
3. Book ends
4. Candleholders
5. Candy dishes
6. Cigarette boxes
7. Dishes
8. Figurines
9. Flowerpots
10. Lamp bases
11. Mugs
12. Novelties
13. Planters
14. Salt and pepper shakers
15. Trays
16. Vases

POTTER'S WHEEL
1. Electric — constant speed, variable speed
2. Kick

SCALES

SIEVES OR STRAINERS — 30 mesh, 50 mesh, 80 mesh

SPONGES
1. Cellulose
2. Elephant ear

SPRAY BOOTH
1. Blower
2. Filters
3. Mask for spraying

SPRAY GUNS
1. Electric
2. Hand

TURNING TOOLS
1. Finishing rubbers
2. Rib
3. Right-and left-hand
4. Scrapers
5. Wire

WEDGING BOARD

Office Machines Repair, Equipment, Tools, and Supplies

The following lists for establishing an office machines repair program are minimum requirements. Additions may be necessary depending upon the extent to which training includes specialized office equipment.

The supply lists are minimum and include those items which should be stocked for general use. Specialized supplies required would depend upon the types and kinds of repairs being made.

Equipment

AIR COMPRESSOR — Pressure range 90 to 120 lbs.

AIR HOSE — 5/16 in. I.D. by 25 ft. with quick detachable connections

CABINET, SMALL PARTS — 10 drawer; 20 5/16 by 30 5/16 by 15 1/2 in.

DRILL PRESS — Complete with 1/2 in. Jacobs chuck, 10 in. by 10 in. working table

EXHAUST FAN — 1/4 h.p.-115 v., 60-cycle, single phase; fan diameter 16 in. — 6 blades, V belt drive, 2140 r.p.m., CFM 1945

GAUGE, SOLDERING

GRINDER — 6 in. H.D. Wheel — 6 in. by 3/4 in. face by 1/2 in. hole; 1/3 h.p., 115 v., single phase, 60-cycle, 3600 r.p.m. with guards, switch, cord tool rests, grinding wheels

LAMP, BENCH TYPE — Air cooled incandescent — 60-watt

LIGHT, VAPOR PROOF — 10 in. diameter, 30° adjustment, with conduit connection

LIGHTS, UNIVERSAL BENCH — With shade

MAGNETIZER-DEMAGNETIZER — 110 v., a.c.-d.c.

OVEN, ELECTRIC — 225° F @ 1000 watts; motor driven, forced-air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 v. a.c., single phase, with thermometer

PARTS, CLEANER — Jet 38 in. long, 21 in. wide, 34 1/2 in. high; 110 v., 60-cycle a.c., single phase

SCREWPLATE — Including 4–36, 6–32, 8–32, 10–24, 10–32, 12–24, 1/4–20

SPRAY, BOOTH — With ventilation; inside 3 by 4 ft. by 6 ft. 10 in. high

SPRAY, GUN — Complete with KS-503 suction feed cup attachment, with quick detachable connector

TRANSFORMER, AIR

TURNTABLE, BENCH — With brake

VISE — Swivel type, jaws 2 in. wide

Small Tools

ALIGNER
1. Royal side
2. Underwood side
3. Side
4. Royal type

BENDER
1. Link
2. Universal bar
3. Royal trip
4. Royal ribbon vibrator arm
5. L.C. Smith sublever
6. Royal bottom rail
7. Underwood back space
8. Woodstock lower bar

BLOW TORCH — Alcohol, blow 1 1/4 by 7 1/4 in.

CLEANING, GUN (Air)

FILE
1. 6 in. warding
2. 4 in. warding
3. 6 in. segment
4. 6 by 1/4 in. pillar
5. 6 by 1/2 in. pillar
6. 6 by 1/2 in. course pillar
7. 6 in. half round
8. 6 in. square

HACKSAW — Adjustable 10 in. — 12 in. blades

HAMMER
1. Ball peen, 6 oz.
2. Brass, 8 oz.

MILL, UNDERWOOD PLATEN END

LOADER, ROYAL PINION BALL

OIL STONE — One side coarse, and the other fine

OIL STONE, TRIANGULAR

OIL CANS
1. Bench 8 oz.
2. Kit 1 oz.

PLIERS
1. 3 prong 7 in.
2. 9 prong 8 in.
3. Peening 7 in.
4. Wiring 7 in.
5. Long round prong 7 in.
6. Flat duck bill 7 in.
7. Parallel jaw 7 in.
8. Parallel jaw vise 8 in.
9. Chain nose side cutting 7 in.
10. Parallel jaw cutters 8 in.
11. Key lever peening 8 in.
12. Key ring 7 in.
13. Curved needle nose
14. Ribbon eyelet, male and female
15. Diagonal cutting
16. With type cutting jaws
17. With wire cutting jaws
18. Vise grip

PICK, ROYAL SEGMENT

PUNCH
1. Centering
2. Pin

REWINDER, RIBBON
ROLLER TYPE BAR — 8 in.
STRIPPER, PLATEN
SOCKETS, ROYAL
1. 7/32 in.
2. 1/4 in.
3. 5/16 in.
4. 5/32 in.
5. 3/16 in.
SCREWDRIVER
1. Royal 7/32 in.
2. Split nut 10 in.
3. Split blade 12¾ in.
4. Shank / Blade Length / Overall Length
5/32 in. / 2 in. / 4⅛ in.
5/32 in. / 3 in. / 5¾ in.
5/32 in. / 4 in. / 7¼ in.
5/32 in. / 10 in. / 13⅞ in.
7/32 in. / 4 in. / 8¼ in.
7/32 in. / 7 in. / 11¼ in.
5/16 in. / 8 in. / 12⅞ in.
SCRIBERS, SPRING HOOK
TOOL, KEYRING REMOVING
TWEEZERS — 6 in.
HAND VISE
WRENCH — Underwood electric impression control screw adjusting
1. Royal — Open end, 1/4, 7/32 + 9/64, 5/16, 17/16, 13/32, 5/16 + 9/64, 3/8 in.
2. L. C. Smith — ½ and ⅜ in. (Motion); escapement; ribbon friction adjustment
3. Remington — 1/4 + ½ in., ⅜ + 7/32 in., 5/16 + 5/16 in., 1/4 + 3/8 in., 15/64 + 5/16 in.
4. Escapement
5. Motion adjustment nut
6. Segment shift stop screw nut
7. Margin release lever shaft stop screw
8. Ribbon vibrator universal bar
9. Woodstock, 1/8, 1/4, 3/8, 9/16 in.
10 Toggle 5/16, 1/4, 7/32, 3/4 in.
11. Box — 1/4 + 5/16 in. offset
12. Carriage rail screw
13. Universal bar nut upper

Supplies

BRUSHES
1. Tapered wire handle
2. Large cleaning
3. Enamel
4. Oil
5. Type cleaning
6. Benzine
7. Transfer cement
BUFFING COMPOUND — 2 lb. cans
CLOTH CLEANING-POLISHING
CEMENT, TRANSFER — 4 and 8 oz. cans
CLEANER, TYPE — 2 oz. — 7 oz. cans
EMERY CLOTH — Fine, medium, and coarse
ENAMEL, WRINKLE
1. Black
2. Grey
3. Brown
HANDLE, FILE
1. Large
2. Small
KIT, DECALCOMANIA
LACQUER, SPRAYING
1. Black gloss
2. Black dull
3. Grey, brown, green
4. Clear
LACQUER STICK, ENGRAVERS'
1. White
2. Black
3. Red
4. Blue
5. Yellow
6. Green
7. Gold
8. Silver
MARKING CRAYON OIL
1. Light typewriter
2. Non fluid ball bearing
POLISH, CLEANER — 8 oz. cans
PADS, TYPEWRITER
1. Wool felt
2. Sponge rubber
PASTE, SOLDERING
REDUCER, ENAMEL
REMOVER, RUST & TARNISH — 8 oz. cans, pts., qts.
STEEL WOOL
SOLDER
1. Acid core
2. Rosin core
THINNER, SPRAYING

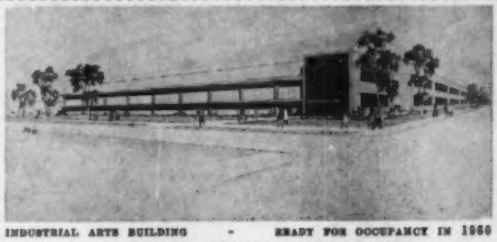
Refrigeration Equipment, Tools, and Supplies

These lists for establishing a refrigeration program include all basic items. Individual instructors will likely devise special units and construct these units as necessary to augment standard equipment and small tools. Supplies listed include those items which should be stocked in the shop. They do not include specialized items necessary during the repair of specific refrigeration units.

Equipment

ACETYLENE REGULATOR, WELDING — 30 lb., 400 lb. capacity
ANALYZER, HERMETIC
BENCHES
1. Soldering
2. Service and assembly

(Continued on page 76A)



INDUSTRIAL ARTS BUILDING - READY FOR OCCUPANCY IN 1960

1959 - SUMMER SESSIONS

• INTERIM SESSION - JUNE 15 - 19
GRAPHIC ARTS WORKSHOP - DRIVER & SAFETY EDUCATION WORKSHOP FOR SCHOOL BUS DRIVERS

• REGULAR SESSION - JUNE 22 - JULY 31
• POST SESSION - AUGUST 3 - 28

TECHNICAL AND ARCHITECTURAL DRAWING ELECTRONICS - WOODWORK - METAL WORK - DRIVER & SAFETY EDUCATION - PROFESSIONAL EDUCATION COURSES IN ADMINISTRATION & SUPERVISION, ELEMENTARY SCHOOL INDUSTRIAL ARTS, SCHOOL SHOP PLANNING - RESEARCH IN INDUSTRIAL EDUCATION

A.B. and M.A. Degree Programs of Study Leading to Credentials in Public Education

For Information Contact
DR. HEBER SOTZIN, HEAD, INDUSTRIAL ARTS DEPARTMENT

SAN JOSE STATE COLLEGE
SAN JOSE 14, CALIFORNIA

THE PENNSYLVANIA STATE UNIVERSITY
Department of INDUSTRIAL EDUCATION

1959 SUMMER SESSION
Inter-Session.....June 8 to June 26
Main Session.....June 29 to August 8
Post-Session.....August 10 to August 28
First Six Weeks Session....June 8 to July 17
Second Six Weeks Session. July 20 to Aug. 28

Vocational Industrial and Industrial Arts Education

Doctors, Masters and Baccalaureate Degrees

Separate graduate and undergraduate curricula in vocational industrial and in industrial arts education for in-service teachers, supervisors, administrators, and other qualified individuals. Short unit courses dealing with national, state and local problems.

For further information and catalog address:
Director of Summer Sessions
Room 101, Willard Hall
THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

(For more information from advertisers, use the postcard on page 91A)

(Continued from page 75A)

CHUCK, ENGINE LATHE
1. 5 in. — 3 jaw universal
2. 7½ in. — 4 jaw independent

CUTTER PIPE — Capacity ⅛ to 2 in.

DOG, ENGINE LATHE — ½ to 4 in.

DRILL PRESS — Floor type, No. 2 Morse Taper-Jacobs chuck, capacity ½ in.

DRILL
1. ¼ in. HD 7¾ in. overall
2. Morse straight shank HS set 1/16 to ½ in. by 64ths
3. Morse straight shank HS set A to Z sizes
4. Morse straight shank HS set Nos. 1 to 70, with block

EXTRACTOR — Bearing No. 1

FURNACE SOLDERING — 14 in. long, 13,000 BTU, fire pot opening 4½ by 3 in.

GRINDER — 115 v., single phase, 60-cycle, 10 by 1 by 3 in. wheels, 1800 r.p.m.

GROWLER, ELECTRIC
1. Range 2 to 7 in., face 2¼ in., 110 v., 60-cycle
2. Range 2 in. up, face 4 in.

IRON, ELECTRIC SOLDERING — 300 watt, 110 v., a.c.-d.c., 14¾ in. long, ⅜ in. tip

OHMMETER — Range .5 Ohm — 50,000 Ohm

OPERATION RECORDER — a.c. & d.c. up to 60 cycles, voltage range 120–250 volt

OVEN, ELECTRIC — 225° F. at 1000 watts, motor driven forced-air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 a.c. single phase, with thermometer

OXYGEN REGULATOR, WELDING — 100 to 3000 lb. capacity, maximum delivery pressure, 50 lb.

PRESS, ARBOR — 1 ton capacity-Ram, 1 by 1 by 7 in., with slotted plate, single leverage

PUMP — Blower-vacuum, air cooled, 4.3 cu. ft. per minute. Pipe outlet-inlet ½ in., maximum pressure intermittent duty, 25 lb. maximum vacuum, intermittent duty 28.5 in., 115 v., a.c. 60-cycle, single phase, ½ h.p. motor

REAMER, PIPE — Capacity ⅛ to 2 in., HS cutter

SCREW PLATE — Including NC-NF standards

STARTER AND ANALYZER — Capacity up to ½ h.p.

TEMPERATURE RECORDER — 20° F. to +130° F. capacity, complete with charts

TESTER — Field coil, 110–220 v., 60-cycle

TESTER — Thermostatic control

THREADER — Ratchet pipe, capacity ⅛ to 1¼ in.

TOOL HOLDER
1. Engine lathe, straight shank, ½ to 1⅛ in.
2. Engine lathe, right hand shank, ½ by 1⅛ in.
3. Engine lathe, left hand shank, ½ to 1⅛ in.

TRUCK, APPLIANCE — Complete 2 wheel type with 15 ft. strap and ratchet

UNDERCUTTER — Mica, 110 v., a.c. motor

VISE — Combination pipe and machinist 4½ in. jaws, pipe capacity ⅛ to 3½ in.

WELDING OUTFIT — Any standard make with Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11 tips, hose and cutting attachments

BENDER, TUBE
1. External, ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.
2. Internal, ⅜, ½, and ⅝ in.
3. Hand tube, mechanical, 3/16, ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

BRUSHES, FITTING — ¼, ⅜, ½, ⅝, ⅞, 1⅛, 1⅜, 1⅝, and 2⅛ in. O.D. tubes

CHARGING LINE
1. Jumper end, 24, 30, and 36 in.
2. Quick coupler end, 24, and 36 in.

CLEANER, TUBE END — ½, ⅝, ⅞, and 1⅛ in. O.D. tubes

CUTTER, TUBE — ⅛ to 1¼ in., 7/16 to 2¼ in.

DETECTOR, HALIDADE LEAK

DRILLS, TWIST — High speed 1/64 to ½ in.

FLARING TOOL — Yoke and die, 3/16 to ½ in. tubing, ¼ to ⅝ in. tubing, ¾ to 1 in. tubing

GAUGES
1. Ammonia, 30 in., 150 lb., 30 in., 300 lb.
2. Retard, 30 in., 5 lb. retard to 200 lb.
3. Compound, 30 in., 150 lbs. with freon 12, 30 in., 60 lb. with: freon 12, sulphur dioxide, 0 to 300 lb., methyl chloride, carrene

GAUGE TESTER — ⅛ in. pipe threads

GOGGLES
1. Welding
2. Grinding

GUNS
1. Air
2. Cleaning

HAMMERS — Ball peen, 2 oz., 8 oz., ¾ lb., and 1 lb.

LIGHTER, TORCH — Friction type

OILER
1. Pistol, 6 oz., 13 in. spout
2. Pump, 1 pt., 15 in. spout

PINCH-OFF — ¼, 5/16, ⅜, and ½ in.

PLIERS
1. Side cutting, 5 and 6 in.
2. Diagonal cutting, 7 in.
3. Long nose, 6 in.
4. Thin nose, 6 in.
5. Pump, 5 slip adjustment
6. Eyelet, and grommet
7. Needle nose, 6 in.
8. Bent nose, 6 in.

PULLER
1. Wheel, 2 arm, 3 arm
2. Fly wheel, chain type
3. Seal ring
4. Oil ring

PUMP, TEMPERATURE AND PRESSURE — 50 lb. P., and 28 lb. vacuum

PUNCHES — Hollow, ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.

REAMER, INNER-OUTER — 3/16 to 1½ in.
3/32 in. 9/64 in. 5/16 in.

REFACERS, SAE — Capacity ¼, 5/16, ⅜, ½, and ⅝ in.

SAWS
1. Hole, ⅞, 1⅛, 1½, 1¾, and 2¼ in.
2. Hack, 8 to 12 in.
3. Utility, 6 in.

SCREWDRIVERS
1. ⅛ in. blade thickness, 2, and 3 in.
2. 5/16 in. blade thickness, 1½, 3, 4, and 6 in.
3. ¼ in. blade thickness, 2, 4, 6, and 8 in.
4. 5/16 in. blade thickness, 8 in.
5. ⅜ in. blade thickness, 6 in., and 8 in.
6. Phillips, Nos. 2 to 4, and 5 to 9
7. Square, ¼ in. blade by 3 5/16 in., 5/16 in. blade by 3 5/16 in.

SNIPS
1. Straight 7, 10, and 12 in.
2. Circular 7, 10, and 12 in.

SOCKETS
1. Packing gland, ¼ in. drive Prong

Depth	Width	Diameter Inside
3/32 in.	⅛ in.	21/64 in.
⅛ in.	⅛ in.	29/64 in.
5/32 in.	5/64 in.	9/16 in.
3/32 in.	7/64 in.	5/16 in.
3/32 in.	5/64 in.	11/32 in.
5/32 in.	⅛ in.	21/64 in.

2. Valve packing nut, oval opening ½ by ⅜ in.
3. Deep and standard — midget, ¼ in. drive, 5/16, 7/32, ¼, 9/32, 5/16, 11/32, ⅜, 7/16, and ½ in., including extensions, handles, universals, and ratchet plugs
   Ferret — ⅜ in. drive, ⅜, 7/16, ½, 17/32, 9/16, 19/32, ⅝, 11/16, ¾, 13/16, and ⅞ in. including extensions, handles, universals, and ratchet plugs
   Master — ½ in. drive, double hexagon, ⅜, 7/16, ½, 9/16, 19/32, ⅝, 11/16, ¾, 25/32, 13/16, ⅞, 15/16, 29/32, 1 1/16, 1⅛, 1 3/16, and 1¼ in. including extensions, handles and universals
   Heavy duty — ¾ in. drive, 1 1/16, 1⅛, 1¼, 1 3/16, 1 7/16, 1½, 1 5/8, 1¾, 1 13/16, and 1⅞ in. including handles and extensions
4. Valve stem — 5/16, 7/32, ¼, 5/16, and ⅜ in., ¼ by 5/16 in., ¼ by 7/32 in.

SWEDGE TOOLS — ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

TACKER, GASKET

TESTERS
1. Control
2. Hermetic
3. Sling psychrometer
4. Thermometer — wall, pocket, remote dial thermometer
5. Moisture indicator — freon and methyl
6. Circuit, 90 v., d.c., 60 v., a.c., 500 v. a.c./d.c.

VALVE KIT — Service set for hermetically sealed units

VISE SAWING — 3/16 to 4 in. capacity

VOLTMETER — 65 volts, 660 volts, a.c. and d.c.

WRENCHES — Open end
1. Ignition type, 7/32 to 15/64 in., ¼ to 9/32 in., 17/64 to 19/64 in., 5/16 to 11/32 in., and ⅜ to 7/16 in.
2. Short open end, 3/16 to 7/32 in., ¼ to 5/16 in., 5/16 to 11/32 in., ⅜ to 7/16 in., and ½ to 9/16 in.
3. Tappet type, 7/16 to ½ in., ½ to 9/16 in., and ⅝ to 11/16 in.
4. Heavy duty, ⅜ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., 19/32 to 11/16 in., ⅝ to 11/16 in., ⅝ to ¾ in., ¾ to 7/8 in., 25/32 to 13/16 in., and 15/16 to 1 in.

WRENCHES — Box
1. Double Broached, ⅜ in. to 7/16 in., ½ to 9/16 in., 19/32 to 11/16 in., ⅝ to ¾ in., 25/32 to 13/16 in., ⅞ to 15/16 in., 1 to 1 1/16 in., 1 1/16 to 1¼ in.
2. Double Hex., 5/16 to ⅜ in., ⅜ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., ⅝ to ¾ in., 11/16 to 13/16 in.
3. Half Moon, 7/16 to ½ in., 9/16 to ⅝ in., ⅝ to ¾ in.
4. Vise grip, 7 and 10 in.
5. Welding tank
6. Pipe, 6, 8, 10, 14, 18, and 24 in.
7. Flare nut, ¾ by 1 in., ⅞ by 1 1/16 in.
8. Refrigerator ratchet, reversible or non-reversible ½ in., 3/16, and ¼ in.
9. Adjustable 4, 6, 8, 10, 12, 18, and 24 in.
   Bristol, No. 4 to ½ in.
   Allen, 5/16 to ½ in.

DESCRIPTIVE MATERIAL

(Continued from page 72A)

ered concisely; for example, the additional equipment required, connections needed, test procedures, and the evaluation of test results. Precautions and supplemental information are included as special notes.

Servicing HI-FI — Volume 3 (AM-FM Tuners). Catalog No. HF-3, 160 pp., 8½ by 11 in., $2.95.

Servicing HI-FI — Volume 4 (Preamps and Amplifiers). Catalog No. HF-4, 160 pp., 8½ by 11 in., illus., $2.95.

Both volumes are excellent for all service technicians, but especially technicians dealing in Hi-Fi sales and service. Information on each model includes Photofact Standard Notation Schematic, resistance charts, cabinet and chassis photographs, parts list and replacement data, dial cord stringing guide, and other time-saving information. A handy cumulative index is located in the front of each book.

These books are sold through electronics parts distributors throughout the country, or available from Howard W. Sams & Co., Inc.

(For further details encircle index code 0320)

State University of New York
Teachers College
OSWEGO

The largest Industrial Arts teacher preparing college in the nation proudly presents the

1959 Summer Session

June 29–August 7, Regular Session

August 10–21, Post Session

Courses, Conferences, Workshops and Laboratories at the graduate and undergraduate level for all vocational and practical arts teachers.

Lake front residence halls • Beautiful sunsets on Lake Ontario • College stables • Educational conferences • Picnic grounds • Private beach on campus • Lectures • Observatory • Campus School • College Union • Reading Center • Excellent Library • Ideal climate • Convenient location • and many other features combine to make your summer educationally rewarding and pleasant.

For bulletin write

Director of Summer Session
State University Teachers College
Oswego, New York

Serving young men and industry

MSOE

The Milwaukee School of Engineering offers a wide choice of educational programs in electrical and mechanical engineering and technology. These technical institute and collegiate engineering courses lead to specific career objectives. In two years, a young man can fulfill the requirements to become an engineering technician with an Associate in Applied Science degree. Or he can continue his studies for four years to earn a Bachelor of Science degree as an electrical or mechanical engineer.

MSOE was founded in 1903. Previous educational, military, or practical experience is evaluated for advanced credit. Courses are approved for veterans. A placement service is provided for all graduates.

ENGINEERING
Bachelor of Science degree in Electrical or Mechanical Engineering

ENGINEERING TECHNOLOGY
Associate in Applied Science degree in Electrical or Mechanical Technology

in the following areas
Electronics Communications • Electrical Power • Computer Technology • Air Conditioning • Plant Engineering • Industrial Technology • Metallurgical Technology

Write for free bulletins on career opportunities. General Catalog on request. Address Dept. IA 359. Guests are invited to tour MSOE laboratories.

New Classes Begin Each Quarter — September, January, March, June

MILWAUKEE
SCHOOL OF ENGINEERING
1025 N. Milwaukee Street Milwaukee 1, Wis.

--BRADLEY UNIVERSITY

Announces the 1959 Summer Session

Comprehensive courses are offered in Industrial Arts and Technical Education at both undergraduate and graduate levels during each of two terms.

Balanced Professional and Shop Courses

A wide variety of courses are offered in the following areas:

EDUCATION	BUILDING CONSTRUCTION
LIBERAL ARTS AND SCIENCES	ELECTRICITY AND ELECTRONICS
INDUSTRIAL AND TECHNICAL EDUCATION	MACHINE DRAFTING AND DESIGN
ARTS AND CRAFTS	METAL
	WOOD

Six semester hours credit may be earned in each of the five-week sessions.

First Term, June 8 — July 11
Second Term, July 13 — August 15

For additional information write Director of Summer Session, Bradley University, Peoria, Illinois

'Rush To The Rockies'*
for
SUMMER STUDY
Work With
OUTSTANDING EDUCATORS
in following fields:

INDUSTRIAL ARTS • VOCATIONAL EDUCATION
PHYSICAL EDUCATION • DISTRIBUTIVE EDUCATION
TRADE AND INDUSTRIAL EDUCATION
AGRICULTURAL EDUCATION • SUPERVISION OF VOCATIONAL EDUCATION • GUIDANCE AND ADMINISTRATION

— VISIT —

• Central City Opera • Red Rocks Amphitheater
• Many Colorado Centennial Cultural Events

Four-Week Terms

June 22 - July 17 • July 20 - August 14

For Additional Information Address
Dean of Summer Session

COLORADO STATE UNIVERSITY
(Formerly Colorado A & M College)
FORT COLLINS, COLORADO

* Colorado Centennial Slogan

(For more information from advertisers, use the postcard on page 91A)

Shop Equipment News

NEW DELTA METALWORKING SCHOOL SHOP LATHE

Rockwell Manufacturing Company's Delta Power Tool Division have introduced an all-new Delta 10-inch metal cutting lathe, designed to fill school shop needs for a safe, low-cost precision lathe with heavy-duty capacity.

The new lathe, compact, modern, and easy to operate — offers three exclusive features. They are (1) variable-speed drive; (2) ¾-in. collet capacity; and (3) a drive that can be preset for both the high and low speed limits in either direct or gear drive.

New Delta Metalworking School Shop Lathe

The variable speed drive gives the operator all the advantages of infinitely variable speed from 50 to 1500 r.p.m., plus the high torque transmitting power of matched V belts in the final drive to the spindle.

The ¾-inch collet capacity is obtained by using a 4-C style collet with a $^{15}/_{16}$-in. hole through the spindle.

Instead of utilizing the full speed range the instructor can preset the v-s drive to whatever speed he wants.

The first 10-inch Delta metal lathe, it offers several other important features, including: a massive, double-row, preloaded, inboard spindle ball bearing which is sealed against dirt and lubricated for life; a quick-change gear box that provides a choice of 54 feeds or thread pitches; a shear pin on the lead screw to protect the lathe against damage from abuse or overleading; and a clutch operation which allows an infinite choice of power transmission from a maximum setting for heavy cuts to a light engagement to avoid overloading the motor.

For further information write to the manufacturer.

(For further details encircle index code 0301)

EMERGENCY LIGHTING UNIT

General Scientific Equipment Company have made available a completely redesigned automatic emergency lighting unit to assure instantaneous light when regular power fails.

Emergency Lighting Unit

Designed primarily for industrial plants, laboratories, hospitals, hotels, institutions, theaters, and other places where that extra margin of safety is essential, this unit is powered by a storage battery built into the portable set, to illuminate the area instantly without touching a switch. A trickle charger automatically maintains the charge of the battery. A built-in hydrometer indicates the state of the battery at a glance.

Nothing to install, simply plug in to any a.c. circuit. The lights are sealed beam of 100 C.P., and will provide continuous light for 10 hours.

Complete information available.

(For further details encircle index code 0302)

DIRECT READING CYLINDRICAL SQUARE

Brown & Sharpe's new 6-in. Direct Reading Cylindrical Square No. 558 shows variations from square in units of .0002 in., directly on the cylinder and eliminates the need for transfer instruments.

Direct Reading Cylindrical Square

One end of the Brown & Sharpe Direct Reading Cylindrical Square is precisely ground and lapped "out-of-square" so that when the cylinder is rotated, its angle with the base surface will at some point match the angle of the workpiece and shut out light against the work. Out-of-squareness is then read directly in .0002 in., by following the dotted curve nearest to the top edge of the working piece to the top of the cylinder.

The cylindrical square is approximately 2½ in. in diameter and 6¼ in., high over all, and measures to a 6-in. height. Surface finish is 6 RMS or better and the diameter is ground

(Continued on page 80A)

YOU TEACH ELECTRONICS EASIER, FASTER WITH EICO KITS & INSTRUMENTS

EXCLUSIVE VISUAL TRAINING AID! Vacuum Tube Voltmeter DYNAMIC DEMONSTRATOR ONLY $10.00

Simulates EICO #221 VTVM in all its functions and ranges. Helps you teach the use and reading of the VTVM with giant 13" meter scale. 14¾" wide x 23" high x 3½" deep. Easily viewed by the complete class. Punched holes for easy hanging. Steel cabinet, aluminum panel.

EICO KITS are top-quality professional TV/radio/electronic test instruments, hi-fi components & amateur radio gear — embody latest performance-proven design and circuitry. Complete with all parts, pre-punched chassis, deep-etched aluminum panel, rugged steel case — plus pictorial diagrams; schematics; data on color codes, soldering, tools. "Beginner-Tested" step-by-step instructions help the student learn by "doing it himself" — quicken his familiarity with the construction, operation and maintenance of electronic equipment. Used by leading vocational schools, colleges & universities throughout the U.S. and the world. Over 1 million sold to date. LIFETIME service & calibration guarantee at nominal cost.

FREE ELECTRONICS WALL CHART of official IRE-EIA symbols, conversion tables, other reference data. Ideal for classroom instruction. VE-3

EICO, 33-00 N. Blvd., L. I. C. 1, N. Y

Please send free Wall-Chart, catalog & name of neighborhood supplier.

NAME.....

SCHOOL.....

ADDRESS.....STATE.....

CITY.....

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

(For more information from advertisers, use the postcard on page 91A)

DIRECTORY OF MANUFACTURERS' PRODUCTS

This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 91A. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 92A.

A

ADJUSTABLE CURVE RULERS
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Fairgate Rule Co.
Modern School Supplies
Post Company, Frederick
Weber Co., F.

AIR FILTERS
Logan Engineering Co.

ALUMINUM PROJECTS
St. Louis Crafts, Inc.

AMMETERS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)

ANGLE PLATES
Challenge Machinery Co.
Machine Shop Project Service

ANVIL BASE
Dixon, Inc., Wm.
Saxcrafts
Stoner Wood Products Co.

ANVILS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts

ANVIL TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Stanley Tools

ARBOR PRESSES
Brodhead-Garrett Co.
Dake Engine Company
Dixon, Inc., Wm.
Patterson Bros.

ARC-WELDING SETS & EQUIP.
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.

ART METAL TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts

AUTOMOTIVE TOOLS AND EQUIPMENT
Alondra Sales, Inc.
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Lufkin Rule Co.
Snap-on Tools Corp.
Starrett Co., The L. S.
Williams Co., J. H.

AWLS, TINNERS
Brodhead-Garrett Co.
Patterson Bros.

B

BABBITT FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.

BAND SAW BLADES
Atkins Saw Div.
Boice-Crane Co.
Delta Mfg. Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Starrett Co., The L. S.
Upholstery Supply Co.
Walker-Turner Co., Inc.

BAND SAW BRAZERS, Electric
Boice-Crane Co.
Foley Mfg. Corp.
Oliver Machinery Co.
Walker-Turner Div.

BAND SAWS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Patterson Bros.
Rouse & Co., H. B.
Walker-Turner Co., Inc.
Yates-American Machine Co.

BAND SAWS, METALCUTTING
Boice-Crane Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Kalamazoo Tank & Silo Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Walker-Turner Div.

BAND SAWS, PORTABLE
Brodhead-Garrett Co.
Delta Mfg. Co.
Patterson Bros.
Walker-Turner Co., Inc.

BAND SAW SETS
Atkins Saw Div.
Brodhead-Garrett Co.
Oliver Machinery Co.

BENCH FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Johnson Gas Appliance Co.
Patterson Bros.

BENCH-PLATES
Challenge Machinery Co.
Dixon, Inc., William
Patterson Bros.

BENCH TOPS
Hardwood Corp. of America
Patterson Bros.
Sheldon Equip. Co., E. H.

BENCHES
Jewelers' and Metal Workers'
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Parent Metal Products, Inc.
Patterson Bros.
Saxcrafts
Sheldon Equip. Co., E. H.

BENCHES, MANUAL TRAINING
Brodhead-Garrett Co.
Challenge Machinery Co.
Engineering Mfg. Co.
Hamilton Manufacturing Co.
Parent Metal Products, Inc.
Patterson Bros.
Sheldon Equip. Co., E. H.
South Bend Lathe Works
Standard Pressed Steel Co.
Tolerton Co.

BENCHES — WORK
Challenge Machinery Co.
Dixon, Inc., Wm.
Patterson Bros.
Sheldon Equip. Co., E. H.
Standard Pressed Steel Co.
Stoner Wood Products Co.
Tolerton Co.

BENCH VISES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Dixon, Inc., William
Drumcliff Co.
Machine Shop Project Service
Morgan Vise Co.
Parent Metal Products, Inc.
Patterson Bros.
Saxcrafts
Sheldon Equip. Co., E. H.
Stanley Tools
Tolerton Co.
Upholstery Supply Co.

BENDERS, METALWORKING
Dixon, Inc., William
Drumcliff Co.
Hossfeld Mfg. Co.
O'Neil-Irwin Mfg. Co.
Patterson Bros.

BINDERY EQUIPMENT & SUPPLIES
Black & Decker Mfg. Co.
Challenge Machinery Co.

BIT HOLDERS, EXTENSION
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

BITS, Auger, Machine, Hollow Chisel, Router
Brodhead-Garrett Co.
Chicago-Latrobe
Irwin Auger Bit Co.
Patterson Bros.
Skil Corp.
Stanley Tools
Upholstery Supply Co.
Walker-Turner Div.
Whitman & Barnes
Williams Co., J. H.

BITS, SCREW DRIVERS
Brodhead-Garrett Co.
Irwin Auger Bit Co.
Patterson Bros.
Snap-on Tools Corporation
Stanley Electric Tool Div.
Stanley Tools
Upholstery Supply Co.

BLACKBOARD DRAWING SETS
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Modern School Supplies
Post Company, Frederick
Weber Co., F.

BLACKSMITH TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Patterson Bros.
Stanley Tools

BLOWERS, FORGE
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.

BLOWPIPES, Brazing, Jewelers'
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts

BLUE-PRINTING MACHINES, ELECTRIC
Dietzgen Co., Eugene
P & H Sales Corp.
Post Company, Frederick

BOARDS, DRAWING
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Fairgate Rule Co.
Garrett Tubular Products, Inc.
Gramercy Guild
Hamilton Mfg. Co.
Modern School Supplies
Post Company, Frederick
Saxcrafts
Stacor Equipment Co.
Tolerton Co.
Weber Co., F.

BOLTS, STOVE, HANGER and Carriage
Southern Screw Co.
Upholstery Supply Co.

BOOKBINDERS' SUPPLIES
American Wood Type Mfg. Co.
Black & Decker Mfg. Co.
Higgins Ink Co., Inc.

BORERS, WOOD
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Oliver Machinery Co.
Patterson Bros.
Skil Corp.
Yates-American Machine Co.

BORING BARS
Armstrong Bros. Tools
Brodhead-Garrett Co.
Patterson Bros.
South Bend Lathe Works
William & Co., J. H.

BORING TOOLS
Armstrong Bros. Tools
Brodhead-Garrett Co.
DeWalt Products Co.
Patterson Bros.
Skil Corp.
South Bend Lathe Works
Stanley Tools
Williams & Co., J. H.

BOW COMPASSES, DIVIDERS, PENS, PENCILS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Modern School Supplies
Post Company, Frederick
School Products Co.
V & E Mfg. Company
Weber Co., F.

BRACES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

BRACKETS, SAWHORSE
Drumcliff Co.
Upholstery Supply Co.

BRAD AWLS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

BRAKES, METALWORKING
O'Neil-Irwin Mfg. Co.
Patterson Bros.
Stueck, Inc., W. Whitney

BRASS FURNACES, GAS
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.
Western Materials Co.

BRASS PROJECTS
St. Louis Crafts, Inc.

BRAYERS
Brodhead-Garrett Co.
Dixon, Inc., William
Saxcrafts

BRAZING TORCHES
American Gas Furnace Co.
Patterson Bros.

BRISTOL BOARD
Brodhead-Garrett Co.
Post Company, Frederick
Saxcrafts
Weber Co., F.

BRUSHES, ARTISTS'
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Drumcliff Co.
Modern School Supplies
Saxcrafts
School Products Co.
Weber Co., F.

BRUSHES, CIRCULAR, BRISTLE AND WIRE (All Kinds)
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Knudson, E. C.
Saxcrafts

BUFFERS, BENCH, PEDESTAL
Baldor Electric Co.
Brodhead-Garrett Co.
Craftools, Inc.
Delta Mfg. Co.
Dixon, Inc., William
Patterson Bros.
Walker-Turner Div.

C

CABINET HARDWARE
Brodhead-Garrett Co.
Standard Pressed Steel Co.
Upholstery Supply Co.

CABINETS, Cuts, Furniture, Galleys, Inks, Type, and Rollers
Hamilton Mfg. Co.
Parent Metal Products, Inc.
Standard Pressed Steel Co.
Tolerton Co.

CALIPERS
Alvin & Company
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Drumcliff Co.
Lufkin Rule Co.
Millers Falls Co.
Modern School Supplies
Patterson Bros.
Starrett Co., L. S.
Western Materials Co.

CARVING TOOLS for Wood and Linoleum
Brodhead-Garrett Co.
Craftools, Inc.
Drumcliff Co.
Patterson Bros.
Saxcrafts

CENTER LATHE
Brodhead-Garrett Co.
DeWalt Products Co.
LeBlond Machine Tool Co.
Patterson Bros.
South Bend Lathe Works
Walker-Turner Div.
Whitman & Barnes

CERAMICS, SUPPLIES
Brodhead-Garrett Co.
Craftools, Inc.
Electric Hotpack Co., Inc.
Saxcrafts
School Products Co.
Seeley's Ceramic Studio
Thompson Corp., Geo. S.
Tolerton Co.

CHARTS
Brodhead-Garrett Co.
Starrett Co., The L. S.

CHASING TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Saxcrafts

CHISELS, Cape, Cold, Grooving
Brodhead-Garrett Co.
Cincinnati Tool Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
Snap-on Tools Corp.
Stanley Tools
Williams Co., J. H.

CHISELS, FRAMING, MORTISE
Boice-Crane Co.
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

CHISELS, Metal Cutting and Wood Carving
Brodhead-Garrett Co.
Cincinnati Tool Co.
Dixon, Inc., William
Duro Metal Products Co.
Greenlee Tool Co.
Patterson Bros.
Saxcrafts
Upholstery Supply Co.
Williams Co., J. H.

CHUCKS, COMBINATION
Atlas Press Co.
Brodhead-Garrett Co.
South Bend Lathe Works

CHUCKS, DRILL
Brodhead-Garrett Co.
Chicago-Latrobe
Cincinnati Lathe & Tool Co.
DeWalt Products Corp.
Dixon, Inc., William
Patterson Bros.
Stanley Electric Tools
Whitman & Barnes

CHUCKS, INDEPENDENT, Universal Combination
Brodhead-Garrett Co.
Boice-Crane Company
Patterson Bros.
South Bend Lathe Works

CIRCULAR-SAW BENCHES
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.

for PINE LUMBER?
Look no more, Stark has it!

- HARDWOOD LUMBER
- HARDWOOD PLYWOOD
- SOFTWOOD LUMBER
- SOFTWOOD PLYWOOD

W.P.STARK
LUMBER COMPANY
Fairfax Industrial District
Kansas City 15, Kansas

SHOP EQUIPMENT NEWS

(Continued from page 78A)

and honed to within .0001 in. Ends are ground, lapped and serrated to reduce friction and decrease inaccuracy from dust. Cylinder is case hardened with clear, black dotted curves and numerals.

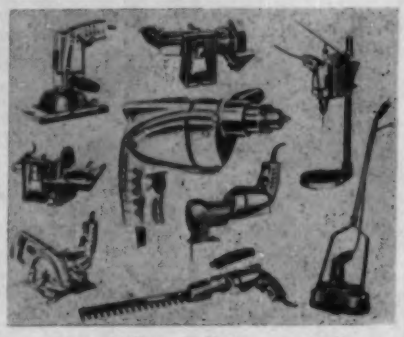
Additional information may be obtained. Write for Bulletin No. M-71, "558 Cylindrical Square."

(For further details encircle index code 0303)

NEW MILLERS FALLS POWER DRILL

Millers Falls Company have announced "the drill that drives a workshop" — their new No. 1114 Power Drill.

This versatile new ¼-in. electric drill serves as a power plant for a complete 14-tool power workshop and makes it possible to own tools ranging all the way from a 5½-in. portable circular saw to a twin-brush electric floor polisher at far less than the cost of separate, individually powered tools.



New Millers Falls Power Drill No. 1114

The No. 1114 has a full 2.7 amp. power rating, and it is geared to 2250 r.p.m., for high torque. Other features include a pistol grip, trigger switch with lock and automatic release, side handle, new spindle lock, geared key chuck, handsome full-polish finish, and a specially machined nose on which all attachments mount permitting direct drive from the spindle with minimum loss of power.

Most of the 1114's attachments are the same as those used with the "888" Power Unit, though some have been specially engineered for the 1114.

In addition to the No. 1114, two other new ¼-in. drills are being offered. The No. 1115 is identical to the 1114 except that it has a saw grip. The No. 1134 has a pistol grip like the 1114 but is equipped with ball-bearing armature. It is intended for more severe service in light industry, garages, repair shops, etc.

More details available upon request.

(For further details encircle index code 0304)

NEW BRUNING DIAZOTYPE COPYING MACHINE

Charles Bruning Company, Inc., has announced a new high speed, high quality diazotype whiteprint machine, known as Bruning Copyflex Model 675. It embodies recently designed features for reducing operator fatigue and increasing production. Intended for large scale black on white reproduction of engineering and architectural prints, the unit employs

(Continued on page 82A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

FREE!

THIS BIG ILLUSTRATED
LEATHERCRAFT CATALOG

There is no finer source of materials for Leathercraft projects of all kinds . . . easy-to-assemble kits to enable beginners to make billfolds, gloves, purses, belts and other attractive items . . . top quality tooling and carving leathers for advanced craftsmen. Also complete line of Leathercraft tools, accessories, supplies and instruction books.

ATTENTION
METALCRAFT HOBBYISTS

Here is a comprehensive illustrated catalog from which you can make your selection of aluminum and copper in sheets and shapes for many projects; copper, aluminum and brass foil for metal tooling; kilns, colors and kits for metal enameling; instruction books, tools and accessories for metalcraft of all kinds.

SEND TODAY FOR FREE CATALOG

J. C. LARSON CO.
820 S. TRIPP AVE., DEPT. 8313
CHICAGO 24, ILLINOIS

PEPPER MILLS

a new and different wood turning project

Looking for new wood turning projects? Hundreds of shop instructors have discovered that Pepper Mills make an excellent and practical project. Now you can buy guaranteed mechanisms from the world's largest pepper mill manufacturer. Write today for price information and project sheets.

THE GEORGE S. THOMPSON CORP.
501 Mission St., South Pasadena 3, California

ATTENTION!
AUTO SHOP INSTRUCTORS

Teach your students the advantages of fuel pressure regulation on all gasoline engines!

Send today for FREE wall charts

1. How a fuel pressure regulator works
2. Your answer to vapor lock
3. How "Over-Pressure" causes carburetor flooding.

MAIL COUPON

Alondra, Inc.
959 Crenshaw Blvd.
Los Angeles 19, Calif.

NAME.....
POSITION.....
SCHOOL.....
ADDRESS.....
CITY.....ZONE....STATE.....

Oliver Machinery Co.
Patterson Bros.
Skil Corp.
Upholstery Supply Co.
Walker-Turner Co., Inc.
Yates-American Machine Co.

CIRCULAR SAWS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
DeWalt Products Corp.
Duro Metal Products Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Skil Corp.
Walker-Turner Div.

CLAMPS, ADJUSTABLE, BAR
Adjustable Clamp Co.
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Drumcliff Co.
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.
Upholstery Supply Co.
Williams Co., J. H.

CLAMPS, CARRIAGE, SCREW, WELDERS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Lufkin Rule Co.
Patterson Bros.
Upholstery Supply Co.
Williams Co., J. H.
Wilton Tool Mfg. Co., Inc.

CLEANERS, FILE
Cincinnati Tool Co.
Dixon, Inc., Wm.
Knudson, E. C.
Saxcrafts

COMBINATION SQUARES
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Fairgate Rule Co.
Lufkin Rule Co.
Patterson Bros.
Stanley Tools
Starrett Co., The L. S.

COMPOSING STICKS
Rouse & Co., H. B.

CONTROLLERS, ELECTRIC
Electric Hotpack Co., Inc.

COPING SAW BLADES
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

COPING SAWS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

COPPER NOVELTIES
Copper Shops
School Products Co.

COPPER PROJECTS
St. Louis Crafts, Inc.

COPYING MACHINES — COPYFLEX
Bruning Co., Inc., Charles

CORD, FURNITURE
Upholstery Supply Co.

COUNTERSINKS
Brodhead-Garrett Co.
Chicago-Latrobe
Drumcliff Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.
Whitman & Barnes

CURVES, IRREGULAR
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
DeWalt Products Corp.
Duro Metal Products Co.
Modern School Supplies
Post Company, Frederick
Weber Company, F.

CUT-OFF SAWS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Skil Corp.
Yates-American Machine Co.

CUTTER HEADS
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Patterson Bros.
Yates-American Machine Co.

CUTTER & TOOL GRINDERS
Boice-Crane Co.
Brodhead-Garrett Co.,
Brown & Sharpe Mfg. Co.
LeBlond Machine and Tool Co., R. K.
Patterson Bros.
Skil Corp.

CYLINDER PRINTING PRESS
Challenge Machinery Co.

D

DADO HEADS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Drumcliff Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Skil Corp.
Walker-Turner Co., Inc.
Yates-American Machine Co.

DESKS, Instructors'
Parent Metal Products, Inc.

DIVIDING HEAD
U. S. Burke Machine Tool Div.

DO IT YOURSELF PROJECTS
Machine Shop Project Service
Saxcrafts
School Products Co.
Stueck, Inc., W. Whitney

DOWEL POINTERS
Brodhead-Garrett Co.
Drumcliff Co.
Patterson Bros.

DOWELING JIGS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

DRAFTING MACHINES
Alvin & Company
Bruning Co., Inc., Charles
Modern School Supplies
Universal Drafting Machine Corp.

DRAFTING PAPER
Alvin & Company
Bruning Co., Inc., Charles
General Finishes Sales & Service Co.
Modern School Supplies
School Products Co.

DRAFTING PENS
Alvin & Company
Berger Scientific Supplies, Inc.
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Modern School Supplies
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAFTING TABLES
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Garrett Tubular Products, Inc.
Gramercy Guild
Hamilton Mfg. Co.
Modern School Supplies
Parent Metal Products, Inc.
Post Company, Frederick
Sheldon Equip Co., E. H.
Stacor Equipment Co.
Standard Pressed Steel Co.
Stoner Wood Products Co.
Tolerton Co.
Weber Company, F.

DRAFTSMEN'S INSTRUMENTS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Fairgate Rule Co.
Gramercy Guild
Modern School Supplies
Post Company, Frederick
School Products Co.
V & E Mfg. Company
Weber Company, F.

DRAWING INSTRUMENTS REPAIR PARTS
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Gramercy Guild
Modern School Supplies
Post Co., Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING OUTFITS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Gramercy Guild
Modern School Supplies
Post Company, Frederick
Saxcrafts
V & E Mfg. Company
Weber Co., F.

DRAWING PAPER IN ROLLS AND SHEETS
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Modern School Supplies
Post Company, Frederick
Saxcrafts
School Products Co.
Weber Co., F.

DRILL PRESSES
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
Delta Mfg. Co.
Drumcliff Co.
Duro Metal Products Co.
Patterson Bros.
Saxcrafts
South Bend Lathe Works

DRILL SHARPENERS
Atlas Press Co.
Brodhead-Garrett Co.
Patterson Bros.
Snap-on Tools Corp.

DRILL STANDS, BENCH, POST, PEDESTAL
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Patterson Bros.
Skil Corp.
Snap-on Tools, Corp.
South Bend Lathe Works
Stanley Electric Tools
Whitman & Barnes

DRILLING MACHINES, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Patterson Bros.
Skil Corp.
Snap-on Tools Corp.
Stanley Electric Tools

DRILLING MACHINES, RADIAL
Boice-Crane Co.
Walker-Turner Div.

DRILLS
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Chicago-Latrobe
Dowl-It Co.
Patterson Bros.
Saxcrafts
Skil Corp.
Snap-on Tools Corp.
Stanley Electric Tool Div.
Upholstery Supply Co.
Whitman & Barnes

DRILLS, BENCH AND FLOOR, HIGH SPEED
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
South Bend Lathe Works
Walker-Turner Co.

DRILLS, BREAST
Brodhead-Garrett Co.
Patterson Bros.
Snap-On Tools Corp.
Stanley Tools

DRILLS, CARVING FOR PLASTICS
Brodhead-Garrett Co.
Patterson Bros.
Saxcrafts

DRILLS, HAND
Dixon, Inc., William
Patterson Bros.
Snap-on Tools Corp.
Stanley Tools
Upholstery Supply Co.

DUPLICATORS, MIMEOGRAPH
Dick Company, A. B.

DUST COLLECTORS
Craftools, Inc.
Patterson Bros.
School Products Co.

E

ELECTRIC WELDING EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.
Standard Pressed Steel Co.

ELECTRIC EQUIPMENT, WIRE & SUPPLIES
Brodhead-Garrett Co.
Ohmite Mfg. Co.

ELECTRIC GENERATORS
Standard Electric Time Co.

ELECTRIC MOTORS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., Wm.
Patterson Bros.

ELECTRIC SOLDERING IRONS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Snap-on Tools Corp.
Stanley Tools

ELECTRICAL INSTRUMENTS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)

ELECTRONIC TRAINING PACKAGES
Philco TechRep Div.
Science Electronics

ELECTROTYPES
Badger-American Electrotype Co.

ENAMELING ON COPPER SUPPLIES
Copper Shop
Craftools, Inc.
Dixon, Inc., William
Saxcrafts
School Products Co.

ENGRAVERS' TOOLS AND SUPPLIES
Dixon, Inc., William
Plasticast Co.
Saxcrafts

ENVELOPES
Western States Envelope Co.

F

FILES AND RASPS
Atkins Saw Div.
Brodhead-Garrett Co.
Dixon, Inc., William
Foley Mfg. Co.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Upholstery Supply Co.

FILING CASES
Hamilton Mfg. Co.
Parent Metal Products, Inc.
Weber Co., F.

FILING MACHINES
Boice-Crane Co.
Foley Mfg. Co.

FILMS, INDUSTRIAL TRAINING, TEACHING, ETC.
Aluminum Co. of America
Eastman Kodak Co.
South Bend Lathe Works
Starrett Co., The L. S.

FINISHING MATERIALS
Brodhead-Garrett Co.
General Finishes Sales & Service Co.
Patterson Bros.
Upholstery Supply Co.

FIRE BRICK AND CEMENT
Electric Hotpack Co., Inc.
Saxcrafts

FIRE CLAY
Brodhead-Garrett Co.
Saxcrafts
Western Materials Co.

FISH GLUE, LIQUID
Saxcrafts
Upholstery Supply Co.

FLASKS
Brodhead-Garrett Co.
Sterling National Industries, Inc.
Western Materials Co.

FLEXIBLE SHAFT AND MOTOR OUTFITS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Walker-Turner Co., Inc.

FLEXIBLE STEEL TAPE RULES
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Modern School Supplies
Patterson Bros.
Snap-on Tools Corp.
Weber Co., F.

FLOCK EQUIPMENT AND SUPPLIES
Brodhead-Garrett Co.
DonJer Products
Saxcrafts
School Products Co.

FLUX, SOLDERING
Brodhead-Garrett Co.
Dixon, Inc., William
Saxcrafts
Johnson Gas Appliance Co.
Kester Solder Co.
Patterson Bros.

FOLDING RULES
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Lufkin Rule Co.
Modern School Supplies
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

FORGE TOOLS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

FORGES, Annealing & Melting
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

FORGES, GAS
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Western Materials Co.

FOUNDRY EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Sterling National Industries, Inc.
Tolerton Co.
Western Materials Co.

FREQUENCY METERS, Portable and Switchboard
Brodhead-Garrett Co.

FURNACES, Annealing, Case-Hardening, Forging, Heat Treating, Metal Melting, Soldering, Tempering
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Electric Hotpack Co., Inc.
Johnson Gas Appliance Co.
Patterson Bros.
Western Materials Co.

FURNITURE FOR SHOP PROJECTS
Sheldon Equip. Co., E. H.
Standard Pressed Steel Co.

G

GAUGES, BIT, CABINET, RULE, AND SQUARE
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

GAUGES, CALIPER
Brodhead-Garrett Co.
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.

GAUGES, MARKING, THICKNESS, AND THREAD
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Duro Metal Products Co.
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.

Reduce Fire Hazard

Improve Work

Save Brushes
Save Spray Guns
Save Time

PROTEXEM

New Paint Brush and Spray Gun Care

The care of paint brushes and spray guns used with today's fast drying finishes requires modern, more efficient methods. Protexem VAPOR ACTION Conditioner employs a scientific proven method that softens hard as rock brushes and keeps brushes soft and spray guns always ready to use. It eliminates fire hazard that accompanies open containers.

MODERN MATERIALS REQUIRE MODERN METHODS

Protexem VAPOR ACTION offers you a method of storing brushes and spray guns that saves time, saves equipment and helps improve work.

FREE TRIAL OFFER

Ask about our 30 DAY FREE TRIAL offer and full information on Protexem Conditioners.

WISCONSIN LABORATORIES, Inc.
Dept. IA Dousman, Wisconsin

From Head to Head

FINEST IN FIT, FEEL AND FINISH

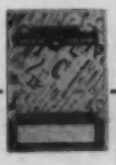
WILLIAMS NEW DESIGN SUPERRENCHES®

Fit Square, precision broached openings and sloppy fits and rounded nuts. Strong but thin heads permit plenty of clearance in tight quarters.

Feel Drop-forged alloy steel allows trim heads and slim handles designed to give the same "balanced feel" in all sizes . . . all styles.

Finish Smooth contours and satin finished handles provide a safe and sure grip. Opening sizes legibly stamped. Chrome plated over nickel.

Equip your shop with BETTER TOOLS for BETTER WORK from the "BROADEST LINE OF ITS KIND"



J. H. WILLIAMS & CO.
Division of United Greenfield Corp.
417 Vulcan St., Buffalo 7, N. Y.

NAME_____

ADDRESS_____

MAIL COUPON FOR FREE CATALOG

SHOP EQUIPMENT NEWS

(Continued from page 80A)

New Bruning Diazotype Copying Machine, Copyflex Model 675

the fumeless, clean, quiet Copyflex diazotype process.

Two operators, each running different types of sensitized materials, can use the machine simultaneously. A split shade on the fast printing 7500 watt lamp (variable to 5000 watts) provides the correct amount of light for each print, thus eliminating the need to run each tracing at a separate speed. Large sheets and roll stock cannot shift on the feedboard; they are held in place by air vacuum ports in and below the feedboard itself. As tracings enter the machine, they are flattened by a feeder band assembly to prevent dog-earing. Incorrectly fed tracings can be ejected by operation of an easily accessible foot lever.

Copyflex Model 675 is supplied with three enclosed swivel type rods beneath the feedboard to accommodate various combinations of roll stock sizes. A wire paper slitter is also mounted under the feedboard.

Write for additional information on Copyflex Model 675.

(For further details encircle index code 0305)

NEW MECHANICS' TOOL CHESTS

The L. S. Starrett Company have introduced a line of professional quality tool chests in wood and metal styles, with and without tools. Available in rigidly reinforced steel or hand rubbed Honduras mahogany, the chests are designed to protect and preserve the fine tools used by machinists and tool and die makers as well as by apprentices, students, and home workshop enthusiasts.

New Starrett Mechanics' Tool Chests

(Continued on page 84A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

Teach
Modern Wood Finishing
with the famous
SEALACELL PROCESS

The "Wipe-on" Finish that
- Eliminates dust troubles
- Requires no brushes
- Protects and preserves wood
- Needs no sanding between coats

SPECIAL OFFER

Our new pocket size Sealacell Penetrating Process Wood Finishing Manual is free on request. Additional student copies sent free with your order of materials.

GENERAL FINISHES SALES and SERVICE CO.
1548 West Bruce St. Milwaukee 46, Wis.

TEACH AN APPRECIATION FOR FINE TOOLS

Chicago-Latrobe, makers of fine drills, reamers, and related cutting tools, compliments the American educational system for the fine job it is doing in preparing young people for useful places in industry. As an aid to the many instructors, Chicago-Latrobe offers two pieces of useful literature:

Pocket, Desk, or Wall Chart of Decimal Equivalents

Book on the CARE of DRILLS and REAMERS

Chicago-Latrobe top quality is widely recognized. The complete line is handled locally by Industrial Distributors.

CHICAGO-LATROBE
430 W. ONTARIO ST. CHICAGO 10

GENERATOR TEST BENCHES
Standard Electric Time Co.
Standard Pressed Steel Co.

GLASS CUTTER
Brodhead-Garrett Co.
Lufkin Rule Co.
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

GLAZING TOOLS
Brodhead-Garrett Co.
Drumcliff Co.
Saxcrafts
Upholstery Supply Co.

GLUE
Bordon Co., The
Brodhead-Garrett Co.
Drumcliff Co.
General Finishes Sales & Service Co.
Higgins Ink Co., Inc.
Patterson Bros.
Saxcrafts
Upholstery Supply Co.

GLUE POTS, ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Oliver Machinery Co.
Patterson Bros.
Upholstery Supply Co.

GRINDERS AND BUFFERS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Boice-Crane Company
Brodhead-Garrett Co.
Craftools, Inc.
Delta Mfg. Co.
Patterson Bros.
Skil Corp.
Stanley Electric Tools
Walker-Turner Div.

GRINDERS, BENCH, PEDESTAL TYPE
Atlas Press Co.
Baldor Electric Co.
Black & Decker Mfg. Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Machine Shop Project Service
Mummert-Dixon Co.
Patterson Bros.
Skil Corp.
Snap-on Tools Corp.
Stanley Electric Tools
U. S. Burke Machine Tool Div.
Walker-Turner Div.

GRINDERS, OILSTONE
Atlas Press Co.
Brodhead-Garrett Co.
Drumcliff Co.
Mummert-Dixon Co.
Oliver Machinery Co.

GRINDERS, TOOL ROOM, SURFACE
Atlas Press Co.
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
South Bend Lathe Works
Stanley Electric Tool Div.

GRINDING MACHINES
Plain Universal, Centerless
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.

GRINDING WHEELS
Atlas Press Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Machine Shop Project Service
Patterson Bros.
Saxcrafts
Skil Corp.
Snap-on Tools Corp.
Stanley Electric Tool Div.

H

HACKSAW BLADES
Atkins Saw Div.
Brodhead-Garrett Co.
Duro Metal Products Co.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Starrett Co., The L. S.
Upholstery Supply Co.

HACKSAWS, Portable, Electric, Power
Brodhead-Garrett Co.
Duro Metal Products Co.
Misener Mfg. Corp.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.

HAMMERS
Brodhead-Garrett Co.
Dixon, Inc., William
Duro Metal Products Co.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Stanley Tools
Upholstery Supply Co.
Williams Co., J. H.

HAMMERS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Skil Corp.
Stanley Electric Tools

HAND SAWS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Patterson Bros.
Saxcrafts
Skil Corp.
Stanley Electric Tools
Upholstery Supply Co.

HAND SCREWS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Patterson Bros.
Upholstery Supply Co.

HANDICRAFT SUPPLIES
Brodhead-Garrett Co.
Copper Shop
Craftools, Inc.
Craftsman Wood Service Co.
Dixon, Inc., William
General Finishes Sales & Service Co.
Hammett Co., J. L.
Patterson Bros.
Saxcrafts
St. Louis Crafts, Inc.
School Products Co.
Upholstery Supply Co.
X-Acto, Inc.

HARDIES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

HEAT-FLOW METERS
Brodhead-Garrett Co.

HEATING ELEMENTS, ELECTRIC
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Saxcrafts

HEAT-TREATING EQUIPMENT
American Gas Furnace Co.
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Johnson Gas Appliance Co.
Patterson Bros.
Saxcrafts
Western Materials Co.

I

IMPACT TOOL, Portable Electric
Skil Corp.
Snap-on Tools Corp.

IMPORTED WOODWORKING TOOLS
Mittermeier, Frank
Saxcrafts
Upholstery Supply Co.

IMPORTERS' GERMAN DRAWING INSTRUMENTS
Alvin & Company
Gramercy Guild
Modern School Supplies

INDUSTRIAL ARTS AWARDS
Ford Motor Co.

INK REMOVERS
Alvin & Company
Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Modern School Supplies
Saxcrafts
Weber Company, F.

INKS, DRAWING AND COLORED
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Modern School Supplies
Post Company, Frederick
Saxcrafts
School Products Co.
Weber Company, F.

INKS, PRINTING
Brodhead-Garrett Co.
Driscoll & Co., Martin
Saxcrafts

J

JEWELERS' TOOLS, EQUIPMENT AND SUPPLIES
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Jewelry Craft Supply
Patterson Bros.
Saxcrafts
Wilton Tool Mfg. Co., Inc.

JIG SAWS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Saxcrafts
Skil Corp.
Walker-Turner Co., Inc.
Yates-American Machine Co.

JOINTERS, BENCH, HAND
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Duro Metal Products Co.
Northfield Foundry & Mach. Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
Yates-American Machine Co.

K

KEENE CEMENT
Brodhead-Garrett Co.

KILNS
Brodhead-Garrett Co.
Copper Shop
Craftools, Inc.
Electric Hotpack Company, Inc.
Saxcrafts
School Products Co.
Western Materials Co.

KNIVES, BAND, MACHINE
Brodhead-Garrett Co.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

KNIVES, HOBBY
Alvin & Company
Brodhead-Garrett Co.
Dixon, Inc., William
Modern School Supplies
Saxcrafts
School Products Co.
X-Acto, Inc.

KNIVES, SLOYD
Alvin & Company
Brodhead-Garrett Co.
Dixon, Inc., William
Modern School Supplies
Patterson Bros.
Saxcrafts
School Products Co.

KNOCK-DOWN FURNITURE
Bedford Lumber Co.
Brodhead-Garrett Co.
Giles & Kendall

KNURLS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
Williams & Co., J. H.

L

LABORATORY STANDARD INSTRUMENTS
Electric Hotpack Co., Inc.

LAMP PARTS & SUPPLIES
Gyro Lamp & Shade Co.

LATEX MOLDING COMPOUNDS
Saxcrafts
School Products Co.

LATHE ATTACHMENTS
Armstrong Bros. Tool Co.
Atlas Press Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Patterson Bros.
Sheldon Machine Co., Inc.
South Bend Lathe Works
Walker-Turner Div.
Williams Co., J. H.

LATHES, Bench, Metal Working
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Duro Metal Products Co.
LeBlond Machine Tool Co., R. K.
Logan Engineering Co.
Patterson Bros.
Sheldon Machine Co., Inc.
South Bend Lathe Works

LATHES, GAP BED
Boice-Crane Company
Brodhead-Garrett Co.
Duro Metal Products Corp.
LeBlond Machine Tool Co., Inc.
Walker-Turner Co., Inc.

LATHES, SMALL PRECISION
Atlas Press Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
South Bend Lathe Works
Sheldon Machine Co., Inc.

LATHES, SPINNING
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Oliver Machinery Co.
Patterson Bros.
Sheldon Machine Co., Inc.
Walker-Turner Co., Inc.

LATHES, WOODWORKING
Ames Precision Machine Works
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Mfg. Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
Yates-American Machine Co.

LAYOUT SURFACE PLATES
Challenge Machinery Co.
Machine Shop Project Service

LEAD AND RULE CUTTERS
Brodhead-Garrett Co.
Rouse Co., H. B.

LEAD HOLDERS, DRAFTING
Alvin & Company
Gramercy Guild

LEADS, DRAFTING
Alvin & Company
Gramercy Guild
X-acto Crescent Prod. Co.

LEATHER
Brodhead-Garrett Co.
Constantine & Son, Albert
Larson Co., J. C.
Saxcrafts
S & S Leather Co.
Upholstery Supply Co.

LEATHER WORKING TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Dixon, Inc., William
Larson Co., J. C.
Saxcrafts
S & S Leather Co.
X-Acto, Inc.

LETTERS AND FIGURES FOR STAMPING METALS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

LEVELS
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Lufkin Rule Co.
Patterson Bros.
South Bend Lathe Works
Stanley Tools
Starrett Co., L. S.
Upholstery Supply Co.

LINOLEUM AND RUBBER BLOCKS AND ENGRAVING TOOLS
Brodhead-Garrett Co.
Saxcrafts
School Products Co.
X-Acto, Inc.

LINOLEUM, BLOCK CUTTING AND PRINTING TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Saxcrafts
School Products Co.
Weber Co., F.
X-Acto, Inc.

LOOM CLAMPS
Brodhead-Garrett Co.
Saxcrafts

LOOMS
Brodhead-Garrett Co.
Hammett Co., J. L.
Saxcrafts

LUMBER
Brodhead-Garrett Co.
Constantine & Son, Albert
Craftsman Wood Service Co.
Foley Lumber Co., T. A.
Giles & Kendall
Hardwood Corp. of America
Stark Lumber Co., Inc., W. P.

LUMBER — HARDWOODS
Brodhead-Garrett Co.
Constantine & Son, Albert
Hardwood Corp of America
Stark Lumber Co., Inc., W. P.

M

MACHINE KNIVES, JOINTER AND SURFACER
Boice-Crane Company
Brodhead-Garrett Co.
DeWalt Products Corp.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

MACHINE LIGHTS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
South Bend Lathe Works
Walker-Turner Div.

MACHINE TOOL DRIVES
Patterson Bros.
Williams Co., J. H.

MACHINISTS' TOOLS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Patterson Bros.
Stanley Tools
Starrett Co., L. S.

MALLETS, HICKORY, RUBBER, RAWHIDE
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Western Materials Co.

MANUAL-TRAINING TOOLS AND SUPPLIES
Alvin & Company
Brodhead-Garrett Co.
Cincinnati Tool Co.
Craftsman Wood Service Co.
Fairgate Rule Co.
Lufkin Rule Co.
Modern School Supplies
Patterson Bros.
Stanley Tools
Starrett Co., The L. S.
Upholstery Supply Co.

MANUAL-TRAINING VISES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Morgan Vise Co.
Parent Metal Products, Inc.
Patterson Bros.
Sheldon & Co., E. H.
Upholstery Supply Co.

MEASURING INSTRUMENTS, ELECTRIC
Alvin & Company
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)

MELTING POT EQUIPMENT
American Gas Furnace Co.
Brodhead-Garrett Co.
Johnson Gas Appliance Co.
Patterson Bros.

METAL CRAFT TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
Dixon, Inc., William
Duro Metal Products Co.
Formit
Lufkin Rule Co.
Patterson Bros.
St. Louis Crafts, Inc.
Saxcrafts

METAL CUTTING SAWS
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DeWalt Products Corp.
Kalamazoo Tank & Silo Co.
Patterson Bros.
Saxcrafts
Skil Corp.
Stanley Electric Tool Div.

METAL SHEARS, ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Patterson Bros.
Saxcrafts
Skil Corp.
Stanley Electric Tools

BUILD YOUR OWN!
FROM BOATS TO TIE-RACKS

Knockdown units made of genuine Tennessee aromatic red cedar and other woods

New 4-color catalogue offers dozens of challenging "do-it-yourself" items

Write:

GILES & KENDALL CO.
Box "E" Huntsville, Alabama

What's Your Interest?

ALL-CRAFTS "SUPER-MART"
Free Catalog — 102 Big Pages

Prompt service on every craft need. Leathercraft, Metalcrafts, Enameling, Woodenware, Mosaic Tile, Ceramics, Art Supplies, many others. Since 1910. Write for free catalog today. Dept. IN-3

SAXCRAFTS (Div. of Sax Bros., Inc.)
1111 N. 3rd St. • Milwaukee 3, Wisconsin

CARVING TOOLS
HOBBYCRAFT SETS

IMPORTED FROM GERMANY
Complete line of Chisels, Gouges & Parting Tools in Straight, Long Bent, Spoon, Back Bent & Fish Tail. Over 35,000 Tools in Stock. Many Special & "Hard to Get" Items. Low Prices. Liberal Discounts to Schools & Dealers.
BIG 8 PAGE FOLDER FREE. Write To-Day.
FRANK HUTTENMEIER (Est. 1936)
2577 E. Tremont Ave., New York 65, N.Y.

SHOP EQUIPMENT NEWS

(Continued from page 82A)

The metal chest, No. 200M, is constructed of rigidly reinforced steel with durable maroon wrinkled finish and contrasting black drawer pulls. It measures 20 by 8½ by 13¾ in., with a 19½ by 7¾ by 3¼-in. top compartment and weighs 28 lbs. Seven drawers have easy-action slides with positive no-fall-out stops plus spring clips to permit easy removal when desired.

The wood chest, No. 200W, is made of selected grain Honduras mahogany with hand rubbed cabinet finish. It measures 20 by 9½ by 13 in., with a 19 by 8¼ by 2⅜-in. top compartment and weighs 19 lb. Nine drawers are furnished in an array of sizes to accommodate large and small tools. Drawers and top compartments of both chests are lined with Starrett red felt.

These new Starrett tool chests are available through industrial distributors and tool stores. Literature describing in detail the chests and the tool assortments is available on request.

(For further details encircle index code 0306)

NEW ALLIED HIGH-FIDELITY SPEAKER

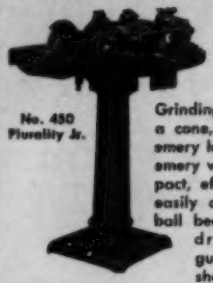
Allied Radio Corporation has announced their new, low-cost Knight KN-808 8-in. High-Fidelity Speaker. Compactly constructed, the Knight KN-808 may be used in stereo and monaural music systems where space is

New Allied High-Fidelity Speaker

(Continued on page 86A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

TOOLS ALWAYS SHARP WITH PLURALITY OILSTONE TOOL GRINDERS



No. 450 Plurality Jr.

NOW AVAILABLE IN 3 SIZES
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

Grinding can be done on a cone, coarse or fine or emery leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

MUMMERT-DIXON CO.
HANOVER, PENNSYLVANIA
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

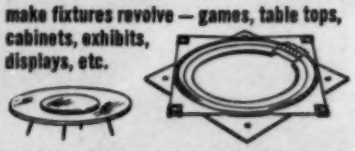
Your Headquarters for Wood and Metal Shop Supplies

The oldest...and most reliable ... firm in the School Shop Supply Field.

PATTERSON BROTHERS
15 PARK ROW NEW YORK, N.Y.
YOUR MOST DEPENDABLE SOURCE SINCE 1848

LAZY SUSAN BEARINGS

make fixtures revolve — games, table tops, cabinets, exhibits, displays, etc.



Save plenty of time and space, make things revolve for comfortable reach with this precision-made bearing. Build it into shelves, coffee and TV tables, tool and parts racks. Fully assembled for immediate use. All-steel with stamped and interlocked sections, and precision made ball-bearings. Complete with instructions for easy, fast installation. Home craftsmen, professional persons, technicians, stores, schools, industry find hundreds of time and space-saving uses. *Bearings available in 3 sizes*

3″ bearing for fixtures up to 18″ dia. $1.00
6″ bearing for fixtures up to 30″ dia. 1.60
12″ bearing for fixtures up to 60″ dia. 4.00

Order by mail. Prompt shipment. Satisfaction or money back. Write for our free catalog of fine tools.

DRUMCLIFF CO., Dept. 389, Towson 4, Md.

Maid-o'-Metal CRAFT METALS and SUPPLIES
it's Fun! it's Easy!

FREE FOR YOUR ARTS & CRAFTS PROJECTS:

HOW-TO-Booklet and MEMOS . . . Idea-packed brochures of illustrated directions and low-cost projects particularly suitable for your class work. Included are directions for Etching and Tooling beautiful Trays, Plaques, Planters . . . . simple Wiggle Engraving of Designs, Lettering, Monograms . . . . etching with a cold-water solution . . . Designing on colored aluminum pieces, etc.

CATALOG for single mail-order source of craft metals and supplies including many new Pre-formed and Colored Items — Wiggle-Engravers, Bracelet Blanks and Bonders, Tray Handles, etc.

Maid-O'-Metal ALUMINUM • BRASS • COPPER — Circles, Rectangles, Foil. Supplies are carefully prepared and selected for ETCHING, TOOLING, ENGRAVING and ENAMELING. Subject to relatively simple processes, they bring ease and assurance to your craft-work, and for 10 years have been the best suited to your requirements.

Cultivate the further enjoyment of your Arts & Crafts program. Review and try these new Maid-O'-Metal aids, ideas, and items — available at your local dealer. Or write us for this free Maid-O'-Metal literature, including direct mail-order information.

ST. LOUIS CRAFTS, INC. DEPT. IA-10 ST. LOUIS 19, MO.

CASTINGS
FOR SCHOOL PROJECTS

Build Home Workshop Machines. Designed for ease in machining and top interest-instruction. Literature on DEPENDABLE CASTINGS free to teachers. Students 20¢

DESIGNERS COMPANY
1342 Washington Ave. Racine, Wis.

(For more information from advertisers, use the postcard on page 91A)

METAL SPINNING EQUIPMENT
Boice-Crane Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts

METALS FOR HANDICRAFT
Brodhead-Garrett Co.
Dixon, Inc., William
Formit
Patterson Bros.
Saxcrafts

METALS, SHEET
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts

METRIC SCALES, FLAT
Dietzgen Co., Eugene
Post Company, Frederick

MICROFILM — ENLARGEMENTS
Bruning Co., Inc., Charles

MICROMETERS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Patterson Bros.
Snap-on Tools Corp.
Starrett Co., L. S.

MILLING ATTACHMENTS
Ames Precision Machine Works
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
Sheldon Machine Co., Inc.
South Bend Lathe Works
U. S. Burke Machine Tool Div.
Williams & Co., J. H.

MILLING MACHINES
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Lathe & Tool Co.
Kearney & Trecker Corp.
Logan Engineering Co.
Patterson Bros.
Rouse & Co., H. B.
Sheldon Machine Co., Inc.
U. S. Burke Machine Tool Div.

MILLING MACHINE VISES
Heinrich Tools, Inc.
U. S. Burke Machine Tool Div.
Wilton Tool Mfg. Co., Inc.

MITER BOXES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

MITERING MACHINES, HAND AND POWER (Printing)
Brodhead-Garrett Co.
DeWalt Products Corp.
Patterson Bros.
Rouse Co., H. B.

MODELING TOOLS
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Saxcrafts
School Products Co.

MORTISERS
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Oliver Machinery Co.
Patterson Bros.
Powermatic Machine Co.
South Bend Lathe Works
Walker-Turner Co., The
Yates-American Machine Co.

MOTORS, ELECTRIC
Baldor Electric Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., Wm.
Patterson Bros.
Stanley Electric Tool Div.

N

NIPPERS, Cutting, Jewelers'
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Starrett Co., L. S.

NOTCHERS
O'Neill Irwin Mfg. Co.

NUTS, MACHINE SCREW
Southern Screw Co.

O

OHMMETERS, PORTABLE
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)

OILSTONE TOOL GRINDER, Power
Brodhead-Garrett Co.
Dixon, Inc., Wm.
Mummert-Dixon Co.
Oliver Machinery Co.
Patterson Bros.

OVEN, PLASTIC PREHEATING
Electric Hotpack Co., Inc.

OZALID PAPER
Dietzgen Co., Eugene

P

PAGE FRAMES
Rouse Co., H. B.

PAINT BRUSH PROTECTOR
Wisconsin Laboratories, Inc.

PAINTS AND VARNISHES
Brodhead-Garrett Co.
General Finishes Sales & Service Co.
Patterson Bros.
Pittsburgh Plate Glass Co.
Saxcrafts
Upholstery Supply Co.

PAPER, CLOTH-BACKED
General Finishes Sales & Service Co.
Post Company, Frederick
Saxcrafts

PAPER CUTTERS
American Wood Type Mfg. Co.
Brodhead-Garrett Co.
Chandler & Price
Post Co., Frederick
Saxcrafts

PAPER, DRAWING AND TRACING
Alvin & Company
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Modern School Supplies
Post Company, Frederick
Saxcrafts
Weber Company, F.

PASTE
Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Saxcrafts
School Products Co.

PENCILS, PLAIN, COLORED, DRAWING, WORKING
Alvin & Company
Dietzgen Co., Eugene
Modern School Supplies
Post Company, Frederick
Venus Pen & Pencil Corp.
Saxcrafts
Weber Company, F.

PENS, LETTERING, INK SHADING
Alvin & Company
Dietzgen Co., Eugene
Gilbert & Miller, Inc.
Gramercy Guild
Modern School Supplies
Post Company, Frederick
Saxcrafts
Weber Company, F.

PEWTER
Dixon, Inc., William
Patterson Bros.
Saxcrafts

PLANERS AND SURFACERS (WOOD)
Boice-Crane Company
Craftsman Wood Service Co.
Delta Mfg. Co.
DeWalt Products Corp.
Northfield Foundry & Mach. Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Patterson Bros.
Powermatic Machine Co.
Skil Corp.
Yates-American Machine Co.

PLANES, HAND
Patterson Bros.
Stanley Tools
Upholstery SupplyCo.

PLANES, PORTABLE, ELECTRIC
Patterson Bros.
Skil Corp.
Stanley Electric Tool Div.
Upholstery Supply Co.

PLASTICS
Constantine & Son, Albert
Cope Plastics
Duro Metal Products Co.
Lufkin Rule Co.
O'Neil-Irwin Mfg. Co.
Patterson Bros.
Plastic Parts & Sales
Plastic Products Co. of Utah
Saxcrafts
Stanley Tools
Starrett Co., The L. S.
Williams & Co., J. H.

PLASTIC PRESSES, FORMING
O'Neil-Irwin Mfg. Co.

PLASTICS — WOOD MATERIALS, HEAT TREATMENT
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.

PLATEN PRESSES
American Wood Type Mfg. Co.
Dake Engine Co.

PLATES — SURFACE, LAYOUT, BENCH
Challenge Machinery Co.

PLIERS
Diamond Tool & Horseshoe Co.
Dixon, Inc., William
Duro Metal Products Co.
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Williams & Co., J. H.

PLYWOOD AND VENEER
American Wood Type Mfg. Co.
Brodhead-Garrett Co.
Constantine & Son, Albert
Craftsman Wood Service Co.
Giles & Kendall

POLISHING CLOTHS
Dixon, Inc., William

PORTABLE ELECTRIC DRILLS
Black & Decker Mfg. Co.
Delta Mfg. Co.
Drumcliff Co.
Patterson Bros.
Saxcrafts
Skil Corp.
Snap-on Tools Corp.
Stanley Electric Tool Div.
Upholstery Supply Co.

PORTABLE WOODWORKING MACHINERY
Black & Decker Mfg. Co.
Boice-Crane Company
Delta Mfg. Co.
Patterson Bros.
Skil Corp.
Stanley Electric Tool Div.
Upholstery Supply Co.
Yates-American Machine Co.

POTTERY EQUIPMENT CLAY AND SUPPLIES
Craftools, Inc.
Electric Hotpack Co., Inc.
Saxcrafts
School Products Co.

PRINTING PRESSES
American Wood Type Mfg. Co.
Challenge Machinery Co.
Chandler & Price

PRINTSHOP EQUIPMENT AND SUPPLIES
American Wood Type Mfg. Co.
Challenge Machinery Co.
Hamilton Mfg. Co.
Rouse Co., H. B.
Saxcrafts

PROJECTS — BLUEPRINTS AND CASTINGS
Designers Company

PROJECTORS
Eastman Kodak Co.

PROTRACTORS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dietzgen Co., Eugene
Drumcliff Co.
Modern School Supplies
Patterson Bros.
Post Company, Frederick
Saxcrafts
Starrett Co., The L. S.

PUBLISHERS
Allyn & Bacon
American Technical Society
Bennett Co., Chas. A.
Bruce Publishing Company
Chilton Co.
Goodheart-Willcox Co., Inc.
International Textbook Co.
McGraw-Hill Book Co., Inc.
McKnight & McKnight
Motor Book Dept.
Sams & Co., Inc., Howard M.

PUNCHES, CENTER, PRICK, AND SOLID
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Tool Co.
Dixon, Inc., William
Patterson Bros.
Snap-on Tools Corp.
Starrett Co., The L. S.

PUNCH PRESSES
Heinrich Tools, Inc.
O'Neil Irwin Mfg. Co.

R

RADIAL SAWS
Skil Corp.
Walker-Turner Div.

RADIO PARTS & EQUIPMENT
Allied Radio

RADIO TEST EQUIPMENT
Allied Radio Corp.
Electronic Instrument Co. (EICO)

REAMERS
Chicago Latrobe
Snap-on Tools Corp.

RESISTANCE BOXES, PLUG AND DIAL
Ohmite Mfg. Co.

REVOLVING STORAGE BINS
Parent Metal Products, Inc.

REVOLUTION COUNTERS
Brown & Sharpe Mfg. Co.

RHEOSTATS
Allied Radio Corp.
Ohmite Mfg. Co.

ROLLERS, METALWORKING
O'Neil Irwin Mfg. Co.

ROUTERS, PORTABLE AND STATIONARY
Brodhead-Garrett Co.
Chicago-Latrobe
DeWalt Products Co.
Duro Metal Products Co.
Patterson Bros.
Skil Corp.
Stanley Electric Tools
Upholstery Supply Co.
Yates American Machine Co.

RULERS, DRAFTING
Alvin & Company
Bruning Co., Inc., Charles
Fairgate Rule Co.
Modern School Supplies
Universal Drafting Machine Corp.

RULES, MACHINISTS' STEEL
Alvin & Company
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Fairgate Rule Co.
Modern School Supplies
Starrett Co., The L. S.

RULES, WOOD, BOXWOOD AND COMBINATION
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Lufkin Rule Co.
Modern School Supplies
Stanley Tools
Upholstery Supply Co.
Weber Company, F.

S

SAFETY GOGGLES
Brodhead-Garrett Co.
General Scientific Co.
Patterson Bros.
Starrett Co., L. S.
Watchemoket Optical Co.
Western Materials Co.

SANDERS, BELT
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Skil Corp.
Upholstery Supply Co.
Yates-American Machine Co.

SANDERS, COMBINATION
Atlas Press Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Corp.
Oliver Machinery Co.
Patterson Bros.
Snap-on Tools Corp.
Walker-Turner Co., Inc.
Yates-American Machine Co.

SANDERS, DISK, DRUM PORTABLE, ELECTRIC
Black & Decker Mfg. Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Drumcliff Co.
Millers Falls Co.
Oliver Machinery Co.
Patterson Bros.
Skil Corp.
Snap-on Tools Corp.
Stanley Electric Tools
Upholstery Supply Co.
Walker-Turner Co., Inc.
Yates-American Machine Co.

SANDING MACHINE
Skil Corp.

SAW FILER
Foley Mfg. Co.
Oliver Machinery Co.
Patterson Bros.

SAW SETS
Atkins Saw Div.
Brodhead-Garrett Co.
Foley Mfg. Co.
Patterson Bros.
Stanley Tools

SAW TRIMMERS (Printing)
Rouse Co., H. B.

SAWS, CIRCULAR, BAND, AND HACK
Atkins Saw Div.
Atlas Press Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Northfield Foundry & Mach. Co.
O'Neil Irwin Mfg. Co.
Patterson Bros.
Rouse & Co., H. B.
Skil Corp.
Snap-on Tools Corp.
Starrett Co., L. S.
Upholstery Supply Co.
Walker-Turner Co., Inc.

SAWS, HOLE CUTTING FOR WOOD AND METAL
Drumcliff Co.
Misener Mfg. Co.
Skil Corp.

SAWS, METALCUTTING
Atkins Saw Div.
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
Misener Mfg. Co.
Patterson Bros.
Skil Corp.
Snap-on Tools Corp.
Starrett Co., The L. S.
Walker-Turner Div.

SAWS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Patterson Bros.
Skil Corporation
Stanley Electric Tools
Upholstery Supply Co.

SCALES, DRAFTING
Alvin & Company
Bruning Co., Inc., Charles
Fairgate Rule Co.
Gramercy Guild
Universal Drafting Machine Co.

SCHOOLS
Bradley University
Colorado State University
Milwaukee School of Engineering
New York University School of Education
Oregon State College
Oswego State Teachers College
Pennsylvania State College
San Jose State College
University of Minnesota
Wayne University
Western Michigan College

SCREWS, WOOD, MACHINE, DOWEL & DRIVE
Southern Screw Co.
Upholstery Supply Co.

SCREW CLAMPS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Columbian Vise & Mfg. Co.
Patterson Bros.
Williams & Co., J. H.

INDUSTRIAL ARTS TEACHERS

prefer CAN-PRO

APRONS & SHOP COATS

Protect your students' clothing with economical shop aprons. Choice of colors. Used in schools coast to coast!

Instructors' coats — 2 distinctive styles, expertly tailored, top quality material. Choice of 5 colors.

Write for free material samples and low, low prices.

CAN-PRO Corporation

29 E. McWilliams Street • Fond du Lac, Wisconsin

SHOP FURNITURE FOR 1959 SHOPS

1. Four Station Workbench for high schools with built-in tool cabinets, sliding doors to lockers.
2. Workbench for junior high schools with or without tools and storage space for tools.
3. Four-Station Workbenks with tools for elementary schools and a novel saw-bench.
4. Four-station drafting and planning table with storage for all drafting equipment.
5. Wall-tool Cabinets and Bench-Tool Cabinets.
6. Metal Working Bench, sheet-metal Benches and Stake-plate Bench with concealed storage for stakes and machines.
7. Anvil Base with storage for anvil tools.
8. DeLuxe Drafting Table with complete equipment storage including T-squares and boards.

GO MODERN! USE SHOP FURNITURE DESIGNED FOR HANDLING LARGER CLASSES WITH LESS DISCIPLINE PROBLEMS.

Write today for literature to:

STONER WOOD PRODUCTS CO.

CHARLESTON, ILLINOIS

DO IT YOURSELF

Mosaics

imported ceramic or glass tile make beautiful mosaic designs.

FREE

OVER 300 FULL SIZE PATTERNS and DESIGN IDEAS:

- Tables
- Lamp Bases
- Picture Frames
- Wall Plaques
- Book Ends
- Mirrors
- Window Sills

SEND FOR illustrated instruction and idea catalog.

25¢ BRINGS you the Booklet listing over 300 Patterns and the catalog FREE.

Modern Mosaics Division

FOR ENAMELISTS!

Kiln and Hundreds of Projects in our

ENAMEL-on-COPPER IDEA BOOK

- New Ideas for Copper and Complete Jewelry Findings for Ceramists.
- Many new Classroom Projects.

FREE Your Idea Book and Kiln Information will be rushed to you.

The Copper Shop Division

IMMERMAN & SONS

Dept. MC-33, 1924 Euclid Ave., Cleveland 15, Ohio

SHOP EQUIPMENT NEWS

(Continued from page 84A)

limited. It may also be used as an extension speaker or as a replacement to improve the fidelity of TV sets and phono consoles.

It features a high-compliance hyperbolic cone to attain smooth, distortion-free response. Additional features include a specially treated cone periphery for excellent bass reproduction, Alcomax-3 magnet material (similar to Alnico V), and binding post terminals to facilitate connection of amplifier leads.

The Knight KN-808 has a frequency response of 40 to 12,000 cps and is designed to handle 15 watts of program material. It has a 1-in. voice coil, cone resonance of 55 cps, and an impedance of 16 ohms. It is listed under Allied Stock No. 82 D 808. Further information available upon request.

(For further details encircle index code 0307)

NEW MODEL-N PRESSES

The Chandler & Price Company has announced a new line of hand-fed platen presses under the style name Model-N. These presses are particularly suitable for school shops.

C & P Model-N Presses have all of the operating advantages of the famous C & P New Series hand-fed presses, but include as standard equipment many refinements and improvements in appearance, construction, and operating features.

Model-N 10 by 15 Press

The front and sides are more fully enclosed to meet modern design principles. All operating controls are placed at the front, convenient to the operator. The finish of the entire press is of an all-new gray. Feed and delivery boards are plastic surfaced in a complementary gray tone.

All necessary equipment is included, so that each press is complete, with no extras to buy or to consider. Such items as floor pan, motor bracket, motor, impression counter, and all gear guards are standard equipment.

Press drive equipment consists of a constant speed motor with variable speed drive, which includes a magnetic starter and switch.

Motor is mounted well above the floor for easy cleaning under the motor bracket.

Adjustable bed tracks, extension roller tracks, and Reliance platen guard are standard. Ink disk is provided with a silent drive. Three cast rollers, three extra roller stocks, six roller trucks are furnished; also two

(Continued on page 88A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

Everything for your Mechanical Drawing Department

WEBER

DRAWING MATERIALS

DRAWING INSTRUMENTS

DRAFTING ROOM FURNITURE

Descriptive data, on request

F. WEBER CO.

PHILADELPHIA 23, PA.

St. Louis 1, Mo.

Patronize Your Nearest Weber Dealer

UNIQUE FINISHES and CRAFTS

DonJer's NEW SCHOOL CATALOG

PRE-TESTED NEW IDEAS FOR SCHOOL SHOP PROJECTS

EVERY DonJer PRODUCT is PRACTICAL, USEFUL and FITS into your CURRICULUM

WRITE FOR YOUR FREE COPY

"SUEDE-TEX"	SILVERPLATE	METAL CRAFT
LATEX MOLDS	Liquid MARBLE	DESIGNS
Liquid LUCITE	PORCELIZING	Liquid FOAM RUBBER

MANY OTHER PRACTICAL ITEMS based on the advice of hundreds of teachers

DONJER PRODUCTS COMPANY

1398 UTICA AVENUE BROOKLYN 3, NEW YORK

KNOCKDOWN CEDAR CHESTS and AROMATIC RED CEDAR LUMBER

Write for Free Price List Today

BEDFORD LUMBER CO.

SHELBYVILLE, TENN.

World's Best Source of Supply for INDUSTRIAL ART DEPARTMENTS of SCHOOLS and INSTITUTIONS

Get this big new manual of "hard-to-get" items for furniture and cabinet-making, antique restoring, and industrial arts. Rare and imported woods, 120 kinds of veneers, inlays, carving blocks, turning squares, clamps, all kinds of hardware, table legs, professional wood finishing materials, inlaid picture kits, mouldings of all kinds, ornamental hardware, hand and power tools. Upholstery supplies, woodworking plans, instruction books, and 1001 other items. Free to teachers (others 50¢—refunded on 1st order).

A COMPLETE REFERENCE GUIDE

Send for Catalog TODAY!

ALBERT CONSTANTINE and SON, INC.

2062 Eastchester Road, New York 61, N. Y.

SCREW DRIVERS
Brodhead-Garrett Co.
Duro Metal Products Corp.
Irwin Auger Bit Co.
Patterson Bros.
Snap-on Tools Corp.
Stanley Tools
Upholstery Supply Co.
Williams & Co., J. H.

SCREW DRIVERS, ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Drumcliff Co.
Skil Corp.
Stanley Electric Tools

SCROLL SAWS
Brodhead-Garrett Co.
Boice-Crane Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., Wm.
Duro Metal Products Corp.
Patterson Bros.

SEALERS AND FINISHES
General Finishes Sales & Service Co.
Patterson Bros.

SHAPER ATTACHMENTS
Heinrich Tools, Inc.
Patterson Bros.
Skil Corp.

SHAPERS, ELECTRIC
Brodhead-Garrett Co.
DeWalt Products Corp.
Patterson Bros.
Stanley Electric Tool Co.

SHAPERS, METAL
Atlas Press Co.
Brodhead-Garrett Co.
Logan Engineering Co.
Patterson Bros.
Sheldon Machine Co., Inc.
South Bend Lathe Works
Williams & Co., J. H.

SHAPERS, WOODWORKING
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Logan Engineering Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Stanley Electric Tools
Walker-Turner Co., Inc.
Yates-American Machine Co.

SHEARS AND SCISSORS, FOR CUTTING METAL
Brodhead-Garrett Co.
Diamond Tool & Horseshoe Co.
Dixon, Inc., William
Heinrich Tools, Inc.
O'Neil-Irwin Mfg. Co.
Patterson Bros.
Saxcrafts
Skil Corp.
Snap-on Tools Corp.
Stanley Electric Tool Div.

SHEET METAL EQUIPMENT AND SUPPLIES
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Heinrich Tools, Inc.
O'Neil Irwin Mfg. Co.
Patterson Bros.
Saxcrafts
Standard Pressed Steel Co.
Tolerton Co.

SHOP COATS, APRONS
Can-Pro Corp.
School Products Co.

SILVERSMITHS' TOOLS AND SUPPLIES
Craftools, Inc.
Dixon, Inc., William
Patterson Bros.
Saxcrafts

SKETCH BLOCKS
Dietzgen Co., Eugene
Weber Co., F.

SLIDE RULES
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Gramercy Guild
Modern School Supplies
Post Company, Frederick
Weber Co., F.

SOLDERING BENCHES
Parent Metal Products, Inc.
Patterson Bros.
Standard Pressed Steel Co.
Tolerton Co.

SOLDERING FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

SOLDERING IRONS, ELECTRIC
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Saxcrafts
Snap-on Tools Corp.
Stanley Tools

SOLDERING SOLUTIONS
Brodhead-Garrett Co.
Dixon, Inc., William
Kester Solder Co.
Patterson Bros.
Saxcrafts

SOLDERS, ALL KINDS
Brodhead-Garrett Co.
Dixon, Inc., William
Kester Solder Co.
Patterson Bros.
Saxcrafts

SPINNING EQUIPMENT AND TOOLS
Atlas Press Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

SPOKESHAVES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Upholstery Supply Co.

SQUARES, BEVEL
Brodhead-Garrett Co.
Fairgate Rule Co.
Patterson Bros.
Rouse & Co., H. B.
Stanley Tools
Starrett Co., The L. S.
Upholstery Supply Co.

SQUARES, COMBINATION
Fairgate Rule Co.
Patterson Bros.
Starrett Co., The L. S.
Upholstery Supply Co.

SQUARES, FRAMING, MITER, TRY
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Fairgate Rule Co.
Lufkin Rule Co.
Patterson Bros.
Rouse & Co., H. B.
Stanley Tools
Starrett Co., The L. S.
Upholstery Supply Co.

STAINLESS STEEL PHOTO SINKS, TANKS, & TRAYS
P & H Sales Corp.

STAINS
Brodhead-Garrett Co.
General Finishes Sales & Service Co.
Larson Co., J. C.
Patterson Bros.
Saxcrafts

STARTERS, MOTOR, Electric
Brodhead-Garrett Co.
DeWalt Products Corp.
Rouse & Co., H. B.

STEEL RULES
Alvin & Company
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Lufkin Rule Co.
Patterson Bros.
Rouse & Co., H. B.
Saxcrafts
Snap-on Tools Corp.
Starrett Co., The L. S.

STEEL SQUARES
Brodhead-Garrett Co.
Dixon, Inc., William
Lufkin Rule Co.
Patterson Bros.
Rouse & Co., H. B.
Saxcrafts
Stanley Tools
Starrett Co., The L. S.
Upholstery Supply Co.

STENCILS, SILK SCREEN
Brodhead-Garrett Co.
Saxcrafts

STOOLS, DRAFTING
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Garrett Tubular Products, Inc.
Hamilton Mfg. Co.
Modern School Supplies
Parent Metal Products, Inc.
Patterson Bros.
Standard Pressed Steel Co.
Stoner Wood Products Co.
Tolerton Co.
Weber Co., F.

SWITCHBOARDS
Brodhead-Garrett Co.
Standard Electric Time Co.

SWITCHES, REVERSING
Brodhead-Garrett Co.
Williams & Co., J. H.

SWITCHES, ROTARY TYPE
Ohmite Mfg. Co.

SWITCHES, SNAP, PUSH BUTTON, AND PLUG
Allied Radio Corp.
Brodhead-Garrett Co.

T

TACHOMETERS, ELECTRIC
Standard Electric Time Co.

TAPE, MEASURING
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Lufkin Rule Co.
Modern School Supplies
Patterson Bros.
Post Company, Frederick
Snap-on Tools Corp.
Starrett Co., The L. S.
Weber Company, F.

TAPS AND DIES
Brodhead-Garrett Co.
Patterson Bros.
Snap-on Tools Corp.

T SQUARES
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Fairgate Rule Co.
Modern School Supplies
Starrett Co., The L. S.
Weber Co., F.

TENONERS
DeWalt Products Corp.
Oliver Machinery Co.
Patterson Bros.
Powermatic Machine Co.
Yates-American Machine Co.

TEST EQUIPMENT, ELECTRICAL
Allied Radio Corp.
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Standard Electric Time Co.

THREAD-CUTTING TOOLS
Armstrong Bros. Tool Co.
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
Snap-on Tools Corp.
South Bend Lathe Works
Williams & Co., J. H.

TONGS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools
Williams Co., J. H.

TOOL AND CUTTER-GRINDER ATTACHMENTS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DeWalt Products Corp.
Mummert-Dixon Co.

TOOL BITS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Chicago-Latrobe
Patterson Bros.
Skil Corp.
South Bend Lathe Works
Whitman & Barnes

TOOL CHARTS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Snap-on Tools Corp.
Stanley Tools

TOOL GRINDERS, ELECTRIC, OILSTONE
Atlas Press Co.
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dumore Company, The
Mummert-Dixon Co.
Patterson Bros.
Skil Corp.
South Bend Lathe Works
Stanley Electric Tools
Upholstery Supply Co.

TOOL HOLDERS
Armstrong Bros. Tool Co.
Atlas Press Co.
Brodhead-Garrett Co
Brown & Sharpe Mfg. Co.
Drumcliff Co.
Parent Metal Products, Inc.
Patterson Bros.
South Bend Lathe Works
Williams & Co., J. H.

TOOL ROOM GRINDERS
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
South Bend Lathe Works
Stanley Electric Tool Div.

TORCHES, GAS
Dixon, Inc., William
Johnson Gas Appliance Co.
Patterson Bros.
Saxcrafts

TRACING PAPER AND CLOTH
Alvin & Company
Brodhead-Garrett Co.
Bruning Co., Inc., Charles
Dietzgen Co., Eugene
Modern School Supplies
Post Company, Frederick
Saxcrafts
Weber Co., F.

TRIANGLES
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Fairgate Rule Co.
Modern School Supplies
Saxcrafts
School Products Co.
Weber Co., F.

TYPE GAUGES
American Wood Type Mfg. Co.
Challenge Machinery Co.
Lufkin Rule Co.
Rouse Co., H. B.

U

UNIVERSAL BOX ANGLES
Challenge Machinery Co.

UPHOLSTERY SUPPLIES
Brodhead-Garrett Co.
Constantine & Son, Albert
Upholstery Supply Co.

V

V-BLOCKS
Challenge Machinery Co.
Machine Shop Project Service
Patterson Bros.

VALVE GRINDING EQUIP.
Black & Decker Mfg. Co.
Skil Corp.
Snap-on Tools Corp.
South Bend Lathe Works

VENEER
Brodhead-Garrett Co.
Craftsman Wood Service Co.
Giles & Kendall

VISES, BENCH, BLACKSMITH
Atkins & Co., E. C.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Desmond-Stephan Mfg. Co.
Morgan Vise Co.
Parent Metal Products, Inc.
Patterson Bros.
Stanley Tools

VISES, MACHINE, METAL-WORKING
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Columbian Vise & Mfg. Co.
Desmond-Stephan Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
Heinrich Tools, Inc.
Morgan Vise Co.
Parent Metal Products, Inc.
Patterson Bros.
Sheldon Equipment Co., E. H.
South Bend Lathe Works
Tolerton Co.
U. S. Burke Machine Tool Div.
Wilton Tool Mfg. Co., Inc.

VISES, PIPE, WOODWORKERS'
Atlas Press Co.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Desmond-Stephan Mfg. Co.
DeWalt Products Corp.
Drumcliff Co.
Machine Shop Project Service
Morgan Vise Co.
Oliver Machinery Co.
Parent Metal Products, Inc.
Patterson Bros.
Sheldon Equipment Co., E. H.
Stanley Tools
Wilton Tool Mfg. Co., Inc.

VOLTMETERS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)

W

WATER SKI BLANKS, PREBENT
Western Wood Mfg. Co.

WATER SKI FOOT BINDINGS
Western Wood Mfg. Co.

WEBBING
Upholstery Supply Co.

WELDING EQUIPMENT, ELECTRIC
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.

WHITE PRINTING MACHINES
P & H Sales Corp.

WOOD FINISHING MATERIALS
Brodhead-Garrett Co.
Craftsman Wood Service Co.
Desmond Bros.
General Finishes Sales & Service Co.
Patterson Bros.
Skil Corp.
Upholstery Supply Co.

WOOD PROJECT MATERIAL
Thompson Corp., Geo. S.
Webcraft, Inc.

WOOD-TURNING LATHES
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
Yates-American Machine Co.

WOODWORKING MACHINES, COMBINATION
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Stanley Electric Tools

WOODWORKING SHAPERS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Greenlee Tool Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Stanley Electric Tools
Walker-Turner Co., Inc.
Yates-American Machine Co.

WOODWORKING TOOLS AND SUPPLIES
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Cincinnati Lathe & Tool Co.
Craftsman Wood Service Co.
DeWalt Products Corp.
Dixon, Inc., William
Dowl-It Co.
Duro Metal Products Corp.
Morgan Vise Co.
Oliver Machinery Co.
Patterson Bros.
Sheldon Equip. Co., E. H.
Skil Corp.
Upholstery Supply Co.
X-acto Crescent Products Co.
Yates-American Machine Co.

WORK BENCHES
Challenge Machinery Co.
Craftools, Inc.
Dixon, Inc., William
Patterson Bros.
Sheldon Equipment Co., E. H.
Stoner Wood Products Co.
Tolerton Co.

WRENCH, IMPACT — Portable, Electric
Skil Corp.
Snap-on Tools Corp.

WRENCHES, Box, Tap, Torque, Ignition, Open End, etc.
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Diamond Tool & Horseshoe Co.
Duro Metal Products Corp.
Patterson Bros.
Snap-on Tools Corp.
Williams & Co., J. H.

The ONE and ONLY
SELF-CENTERING
DOWEL DRILL GUIDE

No guesswork with the Wellman "Dowl-It". Perfect automatic centering and alignment of dowel holes in 5 drill sizes. School shop tested and approved. Heat treated drill guides. 2" jaw expansion.

Only $8.95 POSTPAID

Write for FREE Literature Dept. IAVE-3

"Dowl-It" Company
515 N. Hanover St. — Hastings, Mich.

SEE OUR 1959 CATALOG
PLASTICS
for Industrial Arts

A complete source of supply, Jewelry findings — dyes, glues — Buffs, Tools, Boondoggle, Fiberglas, manuals, project ideas. "A small firm with 15 years of personalized service to schools and teachers." Low wholesale prices, fast service, satisfaction assured.

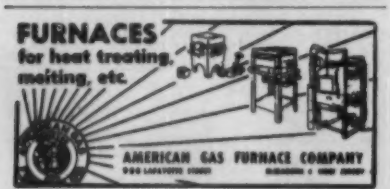
Plastic Products Co. of Utah
P.O. Box 1415 — 937 East 9th South
Salt Lake City 10, Utah
Frank Delvio, Manager

COLTON'S
Reg. U. S. Pat. Off.
No. 10 FILE CLEANER
steel back, frame, and face
CLEANS ALL TYPES OF FILES

furnished with soft steel tapered pick
Strong Metal Construction . . . no wood — no nails — no glue. Handy and Light . . . gives long use.
FREE FOLDER DESCRIBES USE
Write to Dept. A.
E. C. KNUDSON, MFR.
616 W. Randolph St. — Chicago 6, Ill.
Sold Through Distributors

LOOMS, Table and Foot
REED, RAPHIA
HANDICRAFT SUPPLIES
SEND FOR CATALOG
J. L. HAMMETT CO., CAMBRIDGE, MASS.

FURNACES
for heat treating, melting, etc.



AMERICAN GAS FURNACE COMPANY

ELECTRO-TYPERS
Especially qualified to be of service to the school printshop.
Promptness and quality assured.
Forms returned same day received.
Badger - American Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St. — Milwaukee, Wis.

SHOP EQUIPMENT NEWS

(Continued from page 86A)

wrenches, three semi-steel chases, saddle lifter, tympan bale lifter, ink roller stand, and ink fountain throw-off. For shipment, the press is crated as a complete unit.

Three sizes — 8 by 10, 10 by 15, and 12 by 18 — are manufactured, which makes possible the selection of a size suitable for any printing production which can be hand fed.

(For further details encircle index code 0308)

CHALLENGE ANNOUNCES NEW HEIGHT GAUGES

Pacific Height Gauge

A new height gauge that features an easily read micrometer scale from which readings to thousandths and even ten thousandths can be easily made, has been announced by The Challenge Machinery Company.

Height Master units range up to 120 in. in height; accuracies within fifty millionths of an inch.

An important advantage of these units over vernier type units is the easier reading. They also combine the functions of both a height checking and height measuring unit in one complete, relatively inexpensive unit.

Supplied with the gauge as standard equipment at no extra cost are a dial indicator, offset scribes, and other important accessories including a handy carrying case.

The units are also available as Size Master Gauges for measuring the width and other dimensions.

(For further details encircle index code 0309)

NEW KODAK 4-LAMP MOVIE LIGHT

Eastman Kodak Company have announced a compact new 4-lamp movie light bar designed to increase the convenience of indoor home movie making.

It is 14½ in. long, and employs the new, small size, 300-watt, reflector flood lamps. To reduce undesirable shadows, the lighting unit mounts above the camera.

Two switches enable the cameraman to use either the two outside lamps, the two inside lamps, or all four lamps depending upon his needs.

Exposure information based on the use of Kodachrome Type A Film is conveniently located on top of the light bar.

(Continued on page 70A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

SAVINGS FOR STUDENT AMERICA
Special 26048N
Master Bow Pencil and Divider. Made of Brass Nickel with extra parts in box. $2.25 ea., $23.00 doz.
FREE DELIVERY

Drawing Sets
Drafting Instruments
Designing Aids
Drafting Material
Drawing Equipment
Shop Tools
Craft Supplies

Write for FREE Catalog Today!
MODERN SCHOOL SUPPLIES
For the Graphic and Industrial Arts
P.O. Box 958, Hartford 1, Conn.

NEW LIGHT WEIGHT **SHOP COATS**

Especially designed for comfort and long service — sturdy fabric — Button Front — Sanforized — Micrometer Pocket — Extra Breast Pocket.
Attractive Gray Color.
Sizes 36, 38, 40, 42, 44, 46.
ONLY $5 each 2 for $9 — 3 for $13
Write for Free Folder describing other style coats & shop aprons at bargain direct-from-mfr. prices.
SCHOOL PRODUCTS CO., Manufacturers
Dept. F — 330 E. 22nd St., N. Y. 10

• Reedcraft Projects in Swedish Moderne • Ceramic tile in beautiful lustres at new low prices • Leathercraft supplies — Chenille Craft — Stickcraft — Reed Raffia.
Free Brochure and Catalogue on request.
S & S LEATHER CO., INC.
COLCHESTER 7, CONN.

SHOP TEACHERS
Complete stock of lamp parts for your lamp projects shown in our catalog. Also contains charts and instructions for building and wiring lamps. These valuable instructions and catalog sent for 25¢.
GYRO LAMP & SHADE CORP.
3438G N.W. 54th St. — Miami, Florida

LEARN BY DOING
COMPLETE KITS — FULL SIZE
Bench Grinder, Woodworker's Vise, Steel Parallels, Angle & Surface Plates.
FREE BULLETINS
THE MACHINE SHOP PROJECTS SERVICE
612 Birchwood — Traverse City, Mich.

JEWELRY TOOLS · FINDINGS · SILVER
Quality Tools at the Lowest Price
JEWELRY CRAFT SUPPLY
P.O. Box 14 — Forest Hills, N. Y.
Catalogue Available • *Discounts to Schools*

NEW 336 PAGE 9" x 12"
CATALOG · FREE!
Illustrated catalog showing thousands of GRAPHIC ARTS EQUIPMENT & SUPPLIES items . . . FREE! Most complete in history of printing. Send your request on school or institution letterhead.
AMERICAN WOOD TYPE MFG. CO.
Dept. IA, 42-25 9th St., Long Island City 1, N .Y.

High Grade
Printing Inks
For SCHOOL PRINT SHOPS
COVERWELL INKS FOR QUALITY PRINTING
MARTIN DRISCOLL & CO.
610 Federal St. Chicago, Ill. — Portland, Oregon — 407 E. Michigan St. Milwaukee, Wis.

(For more information from advertisers, use the postcard on page 91A)

TEACH
ROCKWELL HARDNESS TESTING
with the
Ames PORTABLE HARDNESS TESTER

Ideal for CLASSROOMS
CAN BE PASSED AROUND EASILY

Hardness Testing of metals is very important in modern manufacture. The Rockwell method is widely used and technical students should understand it.

With the AMES *Portable*, you have an ACCURATE—DURABLE —INEXPENSIVE Hardness Tester using STANDARD Rockwell conversion chart.

Send for a free conversion chart and illustrated bulletin.

AMES PRECISION MACHINE WORKS
Waltham 54, Mass., U.S.A.

Complete Metal Shop IN ONE TOOL!

FOUR TOOLS FOR THE PRICE OF ONE

● This versatile Handnib No. 5A with swivel base, is used for making templates and trial blanks of any shape. It nibbles outside and inside, shears steel sheets up to 3/16" thick, punches up to 1/2" holes through 1/8" stock and cuts drill rods or round stock up to 3/8" diameter. All cutting and punching parts are hardened and ground for long life. This four-in-one tool eliminates hours of tedious handwork in machine shops, tool rooms, and school shops.

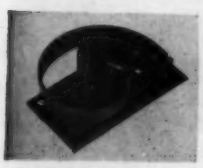
MODEL 5A — Complete for shearing, inside nibbling, outside nibbling, rod cutting and punching, with swivel base.

Send for BIG FREE 28 page catalog showing handnibs and other famous Heinrich tools.

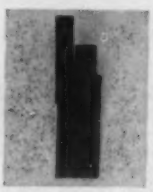
heinrich
QUALITY TOOLS
Dept. IA, RACINE, WISCONSIN

HAND-WROUGHT IRON WORK IS *EASY*

with



Formit



3.50 TOOLS AND MATERIAL

Formit SCROLL DIE

Formit ALL

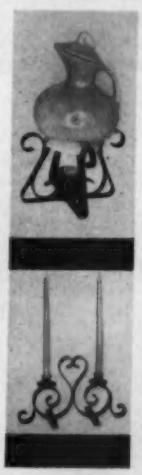
Anyone can create these beautiful projects without experience

- Material is cold formed
- Join components by squeeze riveting
- Formit material is correct thickness for easy, accurate forming
- Formit tools have been especially designed to use this material
- Complete instructions with each tool
- Formit tools and material are not expensive

WRITE FOR FREE FORMIT DESIGN CATALOG AND PRICE LIST

REMEMBER Formit FIRST

P.O. Box 3061
ALBANY 5, NEW YORK



New 1959 Texts for Your Classes

Basic Mechanical Drawing
by Herbert E. Welch

This simply written, completely basic text, tells the student exactly what to do and how to do it, what to draw and how to draw it. Emphasis throughout is on helping students develop drafting skills. The 395 lessons are arranged in order of difficulty, with each lesson teaching a new idea, method or process.

Ceramics
by Vincent A. Roy

An illustrated guide to creating and enjoying pottery. Lavishly illustrated with more than 660 illustrations. Stresses design. Includes construction, design, glazing, firing, and enameling on metals. Offers step-by-step teaching on how to create many beautiful types of ceramic objects. Easy to read and use by junior and senior high school students.

Machine Tool Operation
Part I — New 5th Edition

by Burghardt, Axelrod, and Anderson. New material on turret lathe, cutting angles, and surface measurement.

Automotive Mechanics Series

by William H. Crouse. New editions of these five books covering all recent developments:

Automotive Engines
Automotive Fuel, Lubricating, and Cooling Systems
Automotive Chassis and Body
Automotive Transmissions
Automotive Electrical Equipment

Write to School Department

McGRAW-HILL BOOK CO.
New York 36 — Chicago 46
Dallas 2 — San Francisco 4

(For more information from advertisers, use the postcard on page 91A)

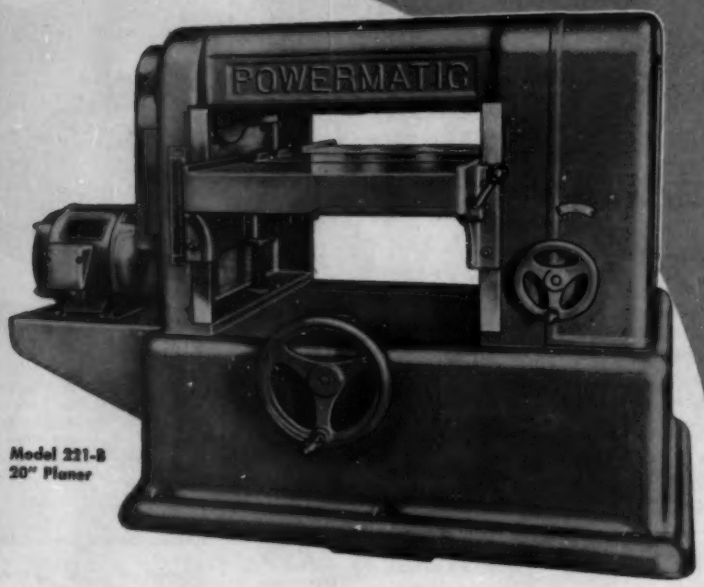
POWERMATIC HEAVY-DUTY

CHANGE FROM ROUGH TO FINISHED STOCK IN SECONDS FOR HIGH PRODUCTION SAVINGS

Quik-Set® Table Roll Adjustment is fast - accurate!

Knife-Grinding & Jointing Attachment (Optional)

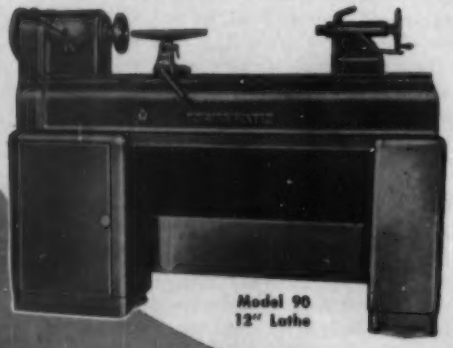
3-Knife Cutterhead Std. (4-Knife Optional)



Model 221-8 20" Planer

PRECISION WOODTURNING—METAL SPINNING

Engineered for precision duty in any shop . . . large or small. 500 to 4000 RPM variable speed. Sealed ball bearing spindle mounting.



Model 90 12" Lathe

NEW LABOR ECONOMY FOR YOU

Here's the planer that makes the job of surfacing a wide range of stocks *really* fast and simple! Never again does the operator spend hours with adjusting wrenches to make stock change-overs. He now does it with a flick of the wrist using the convenient Quik-Set® Table Roll Adjustment. Adjusts all rolls from 0" to .040" in a second! . . . and it's *standard equipment!*

- ALL PARTS CAST IRON OR STEEL — NO DIE CAST
- BELTED OR DIRECT DRIVE
- CHOICE OF 5, 7½ or 10 HP MOTOR
- FEEDS 20 TO 50 FPM

MAIL COUPON TODAY FOR FULL DETAILS

DEALERS IN PRINCIPAL CITIES

• 12, 16, 20 & 24" PLANERS • DRILL PRESSES • JOINTERS
• TENONERS • ARBOR & BAND SAWS
• CHAIN & HOLLOW-CHISEL MORTISERS

POWERMATIC MACHINE COMPANY
McMinnville • Tennessee

POWERMATIC MACHINE COMPANY
McMinnville, Tennessee

Please rush me full details on the Powermatic

☐ Planer ☐ Lathe

Name.....

Address.....

City & State.....

(For more information from advertisers, use the postcard on page 91A)

BRUCE BASIC SHOP TEXTS

Professional

INDUSTRIAL ARTS FOR GRADES K-6, Gerbracht and Babcock
Discusses the functions and methods of industrial arts activities from kindergarten through the sixth grade. $3.50

PROBLEMS IN TEACHING INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Jones
Contains the practical answers offered by hundreds of experienced teachers to the problems most common to industrial arts and vocational education instructors. $3.00

THE SUPERVISION OF INDUSTRIAL ARTS, Bakamis
A new basal text on all phases of the supervision of industrial arts. $3.00

ANALYSIS TECHNIQUE FOR INSTRUCTORS, Fryklund
Explains the analysis technique of teaching and applies it to all subjects and occupations. Offers a method of course organization and teaching in the most efficient manner. $2.50

Automotive

AUTOMOTIVE ESSENTIALS — Revised — . Kuns
A beginner's text with up-to-the-minute illustrations. Shows how to buy, insure, drive, and repair cars. $4.96

LEARNING TO DRIVE, Bostwick, Boodish, and Rodini
In the concise, inexpensive lesson-unit form, this new driver-education course has all the information on the art and science of driving needed by the beginner. 96 cents

AUTO-MECHANICS STANDARD-PRACTICE JOB SHEETS, Bostwick & Yergey
In four parts: The Engine, The Fuel and Electrical Systems, The Power Flow, The Chassis Units. Each part, 48 cents

AUTO MECHANICS, Kuns
Six separate paper-bound volumes covering: (1) The Engine, $2.35, revised; (2) Cooling, Lubrication, and Fuel Systems, $2.35, revised; (3) Automotive Electricity, $2.35; (4) The Power Flow, $2.35; (5) Chassis Units, $2.35; (6) Frame and Body Maintenance, $2.75.

Electricity

FUNDAMENTALS OF APPLIED ELECTRICITY — Revised — Jones
Presented by simple explanation, picture, example, and demonstrations. $3.12

ELECTRICAL ESSENTIALS FOR THE PRACTICAL SHOP, Tustison and Ruehl
Instructional units and job sheets on the most important principles of electrical science and wiring for the beginner. $1.36

RURAL ELECTRIFICATION, Schaenzer
Gives extensive information on all new and important developments having to do with electrification on the farm. $3.75

ELECTRICAL THINGS BOYS LIKE TO MAKE, Cook
Twenty-eight fascinating electrical devices; toy motors, buzzers, etc. Simple directions. $2.75

ELECTRICAL PROJECTS FOR THE SCHOOL AND HOME WORKSHOP, Ford
Thirty-four electrical projects easily made by the average boy. Fully explained and illustrated. $3.00

Metalworking

METALWORK ESSENTIALS, Tustison and Kranzusch
Covers essential bench processes characteristic of the entire field, with all hand-tool manipulations. $2.50

INSTRUCTIONAL UNITS IN MACHINE SHOP, Embretson and Seymour
A complete course in the fundamentals of basic machine work as far as job operations are concerned. 96 cents

MACHINE-SHOP TECHNOLOGY, Felker
Well illustrated and practical, this basic text covers the construction, use and care of the most frequently used hand and power tools. $4.80

ELEMENTARY AND APPLIED WELDING, Groneman and Rigsby
Thoroughly explains all beginning techniques in oxyacetylene and electric arc welding and provides varied, attractive projects. $2.40

ARC WELDING, Zielke
This fine book covers all the fundamentals with technical terminology and detail reduced to a minimum — tools, terms, basic types. Also contains job lessons. 80 cents

FUN WITH METALWORK, Bollinger
A wealth of projects in metalwork that are fun to create. Includes everything from Christmas tree holders to lapel pin silhouettes. $4.75

METAL SPINNING, Reagan and Smith
Revealing the trade secrets of a little known craft, this presentation puts the fine art of metal spinning within the comprehension of students in school shops. $2.25

Kaberlein Sheet Metal Series

AIR CONDITIONING METAL LAYOUT
Up-to-date methods of laying out square, rectangular, and transition fittings used in heating, ventilating, and air conditioning. $4.75

SHORT CUTS FOR ROUND LAYOUTS
Practical and modern methods for laying out and forming patterns for round elbows, angles, T's, offsets, tapers, etc. $4.75

TRIANGULATION SHORT-CUT LAYOUTS
Practical modern methods for laying out and forming patterns used for blower exhaust system, heating, and air conditioning. $5.50

Graphic Arts

PRINTING AND ALLIED GRAPHIC ARTS, Hague
The newly revised edition of **Printing for the Schools,** a general text on all phases of the art with much specialized and related work added. $3.95

MITOGRAPHY: The Art and Craft of Screen Process Printing, Kosloff
All phases of screen process printing from the construction of basic equipment to inks and different types of printing. $3.25

BASIC LESSONS IN PRINTING LAYOUT, Karch
This beginner's book introduces students to layout principles and includes projects and problems. $1.96

Leathercraft

LEATHERWORK PROCEDURE AND DESIGN, Klingensmith
Provides all needed information and projects involving the basic procedures of leatherworking. $3.50

Drawing

GENERAL MECHANICAL DRAWING, Revised Edition, McGee & Sturtevant
A simple, thorough, and completely up-to-date Junior High School text. New edition available in August for September classes. $2.20

MECHANICAL DRAWING, Books I and II, Berg
Over 30 new illustrations and a wealth of new information feature the two-year program. Paper; Book I, 92 cents; Book II, 88 cents: Complete edition: Cloth, $2.80; Paper, $1.80.

MECHANICAL DRAWING, First Year and Second Year, Ermeling, Fischer, and Greene
Newly brought up to date, these texts train students in visualizing and reproducting simple objects. First year, 96 cents; Second year, $1.58

BASIC MECHANICAL DRAWING, Schaefer
For beginners at the seventh-or eighth-grade level, it clearly interprets basic principles and processes. 96 cents

A PRIMER OF BLUEPRINT READING — Revised — Diamond
Well-prepared drills, from the simple to the complicated, for teaching beginners to read working drawings. 68 cents

Woodworking

OPERATION OF MODERN WOOD-WORKING MACHINES — Revised — Hjorth
For beginners in machine woodworking. Paper, $2.80; cloth, $4.00

MACHINE WOODWORKING, Hjorth
Machines and their uses. Advanced text. $3.25

TEXT IN PATTERNMAKING, Hanel
Illustrated basic text in wood patternmaking. $3.48

FUNDAMENTAL WOOD TURNING, Milton and Wohlers
A modernized edition of **A Course in Wood Turning** introducing beginners to the principles of wood turning. $3.50

INSTRUCTIONAL UNITS IN HAND WOODWORK — Revised Edition — Brown, Tustison, and Barocci
Now thoroughly revised and brought up-to-date, these jobs sheets cover the entire range of hand-tool operations. Added are new wood finishing units and 30 projects. $2.64

WOODWORK VISUALIZED, Cramlet
A complete course in graphic form on basic tools and processes for beginners. 131 plates and tests.

PRINCIPLES OF WOODWORKING, Hjorth
For high schools. Fully explains how to use hand and machine tools. Provides instructive projects. $3.36

Mathematics

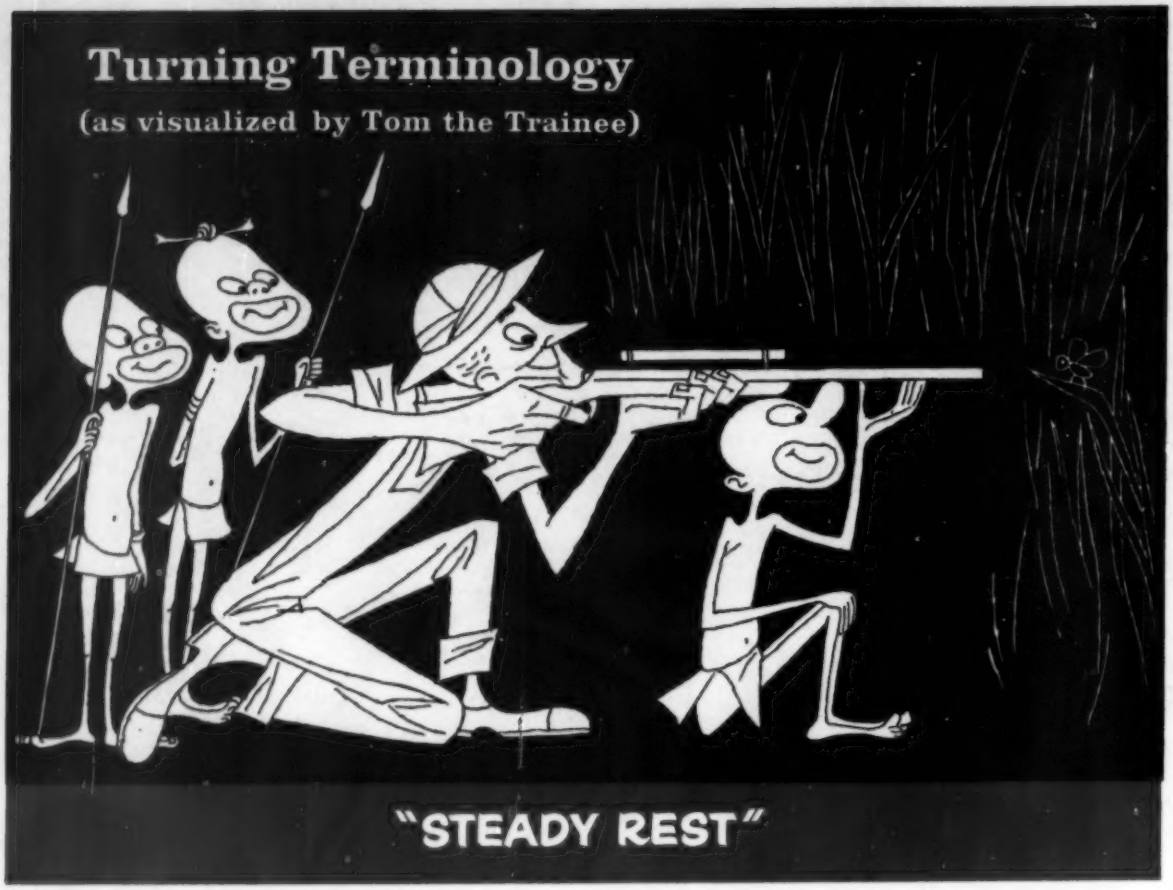
SHOP MATHEMATICS, Revised, Felker
Basic shop mathematics for many of the so-called mechanical trades. $3.24

APPLIED MATHEMATICS, Johnson
Presents a thorough understanding of the practical application of elementary mathematics to the common problems in industrial activities and trade work. $2.20

Look for our Booth No. 33 at the A.I.A.A. Convention.

All books listed are available for 30 days' study. Send for our complete catalog of industrial arts and handicraft books.

THE BRUCE PUBLISHING COMPANY • 703 Bruce Building, Milwaukee 1, Wis.



Tom will quickly learn that LeBlond's steady rests and other turning attachments *are* just as helpful and trustworthy as the most faithful native guide. Worthy companions for famous LeBlond Regal Lathes!

One reason America's training shops are turning to LeBlond Regals – they're the same lathes industry uses. When trainees arrive on the production line, they often find Regals exactly like the ones they were trained on. As a result, they're off to a fast, good start, and the employer is grateful to those who did the training. Check these LeBlond Regal features. 12 speed combination gear-belt drive headstock; hardened and ground replaceable steel ways with compensating vee-way principle; *both* feed rod and lead screw; 48 feeds and threads; automatically lubricated quick-change box; double walled, one-piece apron; and many more.

You're sure of teaching the latest big-lathe practice with LeBlond Regal Lathes. Regals are available in 13", 15", 17", 19", 21", 24" sizes. Also a 13" bench model. Have your LeBlond dealer demonstrate these new Regal features or write for Bulletin R-201 T.

The R. K. LeBlond Machine Tool Company

Cincinnati 8, Ohio
World's Largest Builder of a Complete Line of Lathes for More than 70 Years

LeBLOND of Cincinnati

(For more information from advertisers, use the postcard on page 91A)